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UNITED STATES GOVERNMENT

THROUGH

*The Hydrographic Office.*  
*29 April, 1895.*









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HYDROGRAPHIC OFFICE.

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## SAILING DIRECTIONS

FOR

# LAKE HURON, STRAITS OF MACKINAC,

# ST. CLAIR AND DETROIT RIVERS,

AND

# LAKE ST. CLAIR.

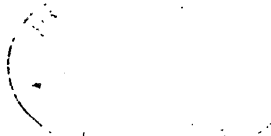
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## PREFACE.

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It is the intention of the Hydrographic Office to publish a complete set of sailing directions for the Great Lakes.

So far there have been published :

Part I, Lake Superior, St. Marys River, and Straits of Mackinac.

Part II, Lake Michigan, Green Bay, and Straits of Mackinac, and the present work,

Part III, Lake Huron, St. Clair and Detroit rivers, and Lake St. Clair.

This will be followed, in turn, by a supplement to Part III: North Channel and Georgian Bay.

Part IV, Lakes Erie and Ontario and a supplement to Part IV: The St. Lawrence River to Montreal.

At Montreal this will connect with Hydrographic Office publication No. 100, thus giving complete sailing directions from Duluth, Minn., to the Atlantic Ocean.

The general description of Lake Huron has been obtained from various encyclopedias, and the description of the coast and harbors chiefly from the annual reports and bulletins of the Chief of Engineers, U. S. Army, and from charts published by the United States Engineers.

The lighthouses, lightvessels, ranges, beacons, buoys, and daymarks are described from the publications of the U. S. Lighthouse Board, and the Department of the Marine and Fisheries, Canada.

Through the courtesy of local authorities much valuable data has been procured.

The first issue of such a work can not be complete and the Office must depend upon the cooperation of those who dwell near the lakes, as well as of those who navigate them, for prompt information concerning any errors or omissions. Such cooperation is earnestly requested.

The articles appended to this work are such as may be of interest and value to the mariner :

“The New Rules of the Road of the United States” (Great Lakes).

“Signals: Weather, Storm, and Temperature, with Diagrams, United States and Canada.”

“Brief Rules for the Use of Oil,” with diagrams.

“Anchoring and Riding out Gales in Deep Water.”

"Currents of Lake Huron," with map, United States Weather Bureau.

"Life-Saving Service," with diagrams.

"General Information."

The thanks of the Office are due, for valuable information furnished in response to its circular letter, to—

Geo. M. Lane, Esq., Secretary of Board of Trade, Detroit, Mich.

John J. Hill, Esq., Mayor of Marine City, Mich.

J. C. Durling, Esq., Harbor Master, Marine City, Mich.

C. T. Morley, Esq., Lake Carriers' Association, Marine City, Mich.

Frank Hart, Esq., Marine City, Mich.

W. H. Scott, Esq., Marine City, Mich.

Fred Denny Larke, Esq., President of Rogers City, Mich.

Ira O. Trumbull, Esq., Huron City, Mich.

John Easby, Esq., President of village of Mackinac, Mich.

C. S. Nims, Esq., Mayor of Sand Beach, Mich.

Capt. Geo. Banks, Au Sable, Mich.

R. S. Chilton, Esq., U. S. Consul, Goderich, Ontario.

Arthur M. Clark, Esq., U. S. Consul, Port Sarnia, Ontario.

M. P. Thatcher, Esq., U. S. Consul, Windsor, Ontario.

John Patton, Esq., U. S. Consul, Amherstburg, Ontario.

Edwin F. Bishop, Esq., U. S. Consul, Chatham, Canada.

This work has been prepared by Lieutenant D. H. Mahan, U. S. Navy, in charge of the Division of Sailing Directions; assisted by Mr. R. C. Ray, U. S. Navy.

The charts and illustrations were prepared under the direction of Mr. G. W. Littlehales, in charge of the Division of Chart Construction of this Office.

C. D. SIGSBEE,  
*Commander, U. S. Navy, Hydrographer.*

U. S. HYDROGRAPHIC OFFICE,  
WASHINGTON, D. C., *March 1, 1895.*

## NOTE.

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The bearings, courses, and trend of the land are true and given in points and degrees.

The directions of the winds, the points from which they blow; the directions of the currents, the points toward which they set.

Distances are expressed in nautical miles (the equivalent statute miles follow in parentheses).

It is well to remember that on Hydrographic Office charts for the Great Lakes bearings and courses are *true*; distances are given in *nautical* miles (the equivalent statute miles follow in parentheses).

On U. S. Engineer charts bearings and courses are *true*; distances are given in *statute* miles.

On British Admiralty charts bearings and courses are *magnetic*; distances are given in *nautical* miles.

**U. S. Engineers' charts to be used in connection with these sailing directions.**

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**STRAITS OF MACKINAC.**

No. 4. Straits of Mackinac.

**LAKE HURON.**

- No. 22. Lake Huron.
- No. 23. South end of Lake Huron.
- No. 21. Presque Ile and Middle Islands.
- No. 19. Thunder Bay.
- No. 18. Saginaw Bay.
- No. 9. Tawas Harbor.
- No. 6. Saginaw River.
- No. 47. Sand Beach Harbor of Refuge.

**ST. CLAIR RIVER.**

No. 37. St. Clair River.

**LAKE ST. CLAIR.**

No. 41. Lake St. Clair.

**DETROIT RIVER.**

No. 56. Detroit River.

The following British Admiralty charts also cover the coasts described :

- No. 334. Mackinac Strait.
- No. 328. Port Collier.
- No. 678. Lakes Erie and Huron (plans, Rattlesnake, Penetanguishene, Goderich, Rondeau Harbors, Port Huron).
- No. 519. Lake Huron.
- No. 906. Cabot Head to Cape Smith and Entrance to Georgian Bay (plans, Tobermory Harbor, Club Harbor, Rattlesnake Harbor).
- No. 330. St. Clair Lake and River.

## CHAPTER I.

### STRAITS OF MACKINAC.

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#### STRAITS OF MACKINAC.

The Straits of Mackinac on the  $45^{\circ} 50'$  parallel, between Point Detour and the NE. point of the Lower Peninsula of Michigan on the east, and Waugoshance light and Point aux Chênes on the west, are  $41\frac{3}{4}$  (48) miles long. At the eastern and western entrances between the points mentioned the Straits are respectively  $22\frac{3}{4}$  ( $26\frac{1}{2}$ ) and 11 ( $12\frac{3}{4}$ ) miles wide, but contracted in the Straits proper to  $4$  ( $4\frac{1}{2}$ ) miles in width between Point St. Ignace on the north, and Mackinac lighthouse on the south. It is here further narrowed by Graham Shoals on the north shore; these shoals are marked by buoys, and are not in the direct route of vessels using the south channel; vessels using the north channel must pass south of the red bell buoy on the south shoal.

The north shore of the Straits is much indented by bays and lined by islands. There are several offlying shoals, but the water is deep close-to, and they offer no serious obstructions to navigation, being out of the direct track.

The south shore of the Straits is comparatively free from indentations. Shoal water extends some 4 ( $4\frac{1}{2}$ ) miles WNW. from the extremity of Waugoshance Point; the outer extremity of this shoal being marked by Waugoshance lighthouse.

The water in the Straits is generally deep, and the shoals lying near the usually traveled routes are marked by lighthouses, lightvessels, or buoys.

#### ROUTES.

**Point Detour to Cheboygan.**—With the buoy on range with Point Detour light and distant  $\frac{1}{3}$  mile, a course SW.  $\frac{1}{8}$  W. (S.  $46^{\circ} 24'$  W.) for  $14\frac{1}{2}$  ( $16\frac{3}{4}$ ) miles will bring Spectacle Reef light abeam to port, distant  $\frac{1}{2}$  mile. Thence SW. by W.  $\frac{3}{8}$  W. (S.  $63^{\circ} 16'$  W.)  $14\frac{1}{2}$  ( $16\frac{3}{4}$ ) miles, passing southward of Poe Reef lightvessel, to a point  $\frac{1}{2}$  mile NNE.  $\frac{7}{8}$  E. (N.  $32^{\circ} 20'$  E.) from the Crib light off Cheboygan, then follow directions for entering the harbor.

**Point Detour to Waugoshance Light.**—With the buoy on range with Point Detour light, and distant  $\frac{1}{3}$  mile, a course WSW.  $\frac{1}{2}$  W. (S.  $73^{\circ} 07'$

W.) for  $23\frac{1}{2}$  (27) miles will pass Bois Blanc light abeam, distant  $1\frac{1}{2}$  ( $1\frac{3}{4}$ ) miles; thence W.  $\frac{3}{8}$  N. (N.  $85^{\circ} 46'$  W.)  $7\frac{1}{2}$  ( $8\frac{3}{4}$ ) miles to the channel between Mackinac and Round islands.

With the red buoy in this channel abeam to starboard a course WSW.  $\frac{3}{8}$  W. (S.  $71^{\circ} 43'$  W.) for  $5\frac{1}{2}$  ( $6\frac{1}{2}$ ) miles, will bring Old Point Mackinac abeam, distant  $1\frac{1}{2}$  ( $1\frac{3}{4}$ ) miles. Thence W.  $\frac{1}{4}$  S. (S.  $87^{\circ} 11'$  W.) for  $14\frac{1}{2}$  (17) miles to abeam of Waugoshance light, distant  $\frac{1}{2}$  mile.

**Point Detour to Main Channel into Georgian Bay.**—With the buoy on range with Point Detour light, and distant  $\frac{1}{2}$  mile, a course of SE. by E.  $\frac{1}{2}$  E. (S.  $59^{\circ} 03'$  E.) for 44 ( $50\frac{1}{2}$ ) miles, will bring a vessel abeam of Duck Island light, distant  $3\frac{3}{4}$  ( $4\frac{1}{2}$ ) miles; ~~thence a course ESE.  $\frac{1}{4}$  E. (S.  $75^{\circ} 56'$  E.) for 55 ( $63\frac{1}{2}$ ) miles should bring a vessel to the entrance of the main channel, with Cove Island light abeam and distant less than one mile.~~ Leave the buoy on Bad Neighbor rock to the northward.

For directions for Georgian Bay see supplement.

**Point Detour to Southampton.**—From on range Detour light and buoy, and  $\frac{1}{2}$  mile from the buoy, a SE.  $\frac{1}{2}$  S. (S.  $39^{\circ} 22'$  E.) course for  $135\frac{1}{2}$  (156) miles will bring a vessel off Southampton. See special directions for entering.

**Point Detour to Kincardine.**—From on range Detour light and buoy, and  $\frac{1}{2}$  mile from the buoy, a SE.  $\frac{3}{4}$  S. (S.  $36^{\circ} 34'$  E.) course for  $143\frac{1}{2}$  (165) miles will bring a vessel off Kincardine. This course will pass close eastward of the 9-fathom bank in the middle of the lake.

**Point Detour to Goderich.**—From on range Detour light and buoy, and  $\frac{1}{2}$  mile from the buoy, a SE.  $\frac{1}{2}$  S. (S.  $35^{\circ} 09'$  E.) course for  $162\frac{1}{2}$  (187) miles will bring a vessel off Goderich.

**Point Detour to St. Clair River and Intermediate Points.**—With the buoy on range with Point Detour light and distant  $\frac{1}{2}$  mile, a course SSE.  $\frac{1}{4}$  E. (S.  $30^{\circ} 56'$  E.) for  $39\frac{1}{2}$  ( $45\frac{1}{2}$ ) miles will bring a vessel abeam of Presque Ile lighthouse, distant 4 ( $4\frac{1}{2}$ ) miles. (Run in on the range if desirous of making this harbor.) The same course continued for  $22\frac{1}{2}$  ( $26\frac{1}{2}$ ) miles will pass Thunder Bay Island light abeam, distant  $3\frac{1}{4}$  ( $3\frac{3}{4}$ ) miles; if wishing to make Alpena, round Thunder Bay Island SE. point at the distance of  $\frac{1}{2}$  mile, then a course SW. by W.  $\frac{3}{8}$  W. (S.  $63^{\circ} 16'$  W.) for  $3\frac{1}{4}$  ( $3\frac{3}{4}$ ) miles until the buoy off North Point bears north, distant  $\frac{1}{4}$  mile, or the extreme eastern part of North Point bears N. by W.  $\frac{1}{2}$  W. (N.  $16^{\circ} 52'$  W.), distant  $1\frac{1}{4}$  ( $1\frac{1}{2}$ ) miles, thence a NW. by W.  $\frac{1}{8}$  W. (N.  $66^{\circ} 05'$  W.) course for  $7\frac{1}{2}$  ( $8\frac{3}{4}$ ) miles will bring a vessel  $\frac{1}{2}$  mile off of Thunder Bay River light. Continuing on from abeam of Thunder Bay Island light, head S. by E.  $\frac{5}{8}$  E. (S.  $18^{\circ} 16'$  E.) for 78 ( $89\frac{3}{4}$ ) miles, which will bring a vessel east of Sand Beach Harbor, distant  $3\frac{3}{4}$  ( $4\frac{1}{4}$ ) miles; (if desired, run in for this harbor). When east of Sand Beach Harbor change course to S.  $\frac{1}{4}$  E. (S.  $8^{\circ} 26'$  E.) for  $50\frac{1}{2}$  ( $58\frac{1}{2}$ ) miles, which will bring a vessel 2 ( $2\frac{1}{4}$ )



miles NE. by E.  $\frac{1}{4}$  E. (N.  $59^{\circ} 03' E.$ ) from Fort Gratiot lighthouse and close to the Canadian shore. See special directions for entering river.

**Point Detour to Saginaw River and Intermediate Points.**—With the buoy on range with Point Detour light and distant  $\frac{1}{2}$  mile, a course SSE.  $\frac{1}{4}$  E. (S.  $30^{\circ} 56' E.$ ) for  $62\frac{1}{2}$  ( $71\frac{1}{2}$ ) miles, will bring a vessel abeam of Thunder Bay light, distant  $3\frac{1}{2}$  ( $3\frac{1}{2}$ ) miles (for running into Thunder Bay, see special directions); change course to S.  $\frac{1}{2}$  W. (S.  $5^{\circ} 37' W.$ ) for 40 (46) miles, which will bring a vessel east of Au Sable light, distant  $4\frac{1}{2}$  ( $5\frac{1}{2}$ ) miles, (if desired, run in for Au Sable when off it.) If intending to make Tawas, change course to SW. (S.  $45^{\circ} W.$ ) for  $14\frac{1}{2}$  ( $16\frac{1}{2}$ ) miles, until Tawas lighthouse bears north, distant  $1\frac{1}{2}$  ( $1\frac{1}{2}$ ) miles, when change course to NW. by W.  $\frac{1}{8}$  W. (N.  $57^{\circ} 39' W.$ ) for the mill at Tawas. Run in on this course, passing southward of Tawas Point buoy, until Tawas lighthouse bears E.  $\frac{1}{2}$  N. (N.  $84^{\circ} 22' E.$ ), when change course to NE.  $\frac{3}{8}$  E. (N.  $52^{\circ} 01' E.$ ) and run into the harbor and anchor in  $3\frac{1}{2}$  fathoms of water. Continuing, when east of Au Sable light, distant  $4\frac{1}{2}$  ( $5\frac{1}{2}$ ) miles, change course to SSW.  $\frac{1}{8}$  W. (S.  $32^{\circ} 20' W.$ ) for 52 (60) miles, passing between the buoys NW. of Charity Island and the buoy SE. of Gravelly Point; this will bring a vessel off Saginaw River. For entering see special directions.

## NORTH SHORE.

From Point Detour the north shore trends in a westerly direction for nearly  $37\frac{1}{2}$  (44) miles, then it abruptly changes its direction to nearly south for  $12\frac{1}{2}$  (14) miles to Point St. Ignace. From Point St. Ignace to Point aux Chênes the coast is clear of danger at the distance of a mile, excepting the Graham shoals.

**Point Detour** is a long narrow peninsula forming the SW. entrance to Detour passage. There are 18-foot patches at  $\frac{1}{4}$  mile SW. and SE. of the point, the latter being marked by a buoy.

**Detour Light.**—A fixed white light, visible  $14\frac{1}{2}$  ( $16\frac{1}{2}$ ) miles, is shown from a white, skeleton tower with a stair cylinder. The tower is connected with a frame dwelling by a covered way. It marks the west side of the entrance to the St. Mary's River.

**Fog Signal.**—The fog signal building is 50 feet east of the lighthouse. A 10-inch steam whistle gives a blast of 8 seconds duration, followed by a silent interval of 52 seconds.

**Point St. Vital** is  $3\frac{1}{2}$  (4) miles west of Point Detour, the shore between receding to the northward, forms a large bay open to the southward. In the NE. corner of this bay is Carlton Bay, which might afford protection to small craft from northerly winds. Seven (8) miles from Point St. Vital is Beaver Tail Point. There are several outlying shoal patches here, and the shore should not be approached within  $1\frac{1}{2}$  ( $1\frac{1}{2}$ ) miles. One

and one-half ( $1\frac{1}{2}$ ) miles west of Point St. Vital is Saddlebag Island, and  $2\frac{1}{2}$  ( $3\frac{1}{2}$ ) miles farther westward, Albany Island.

**Martin Reef** is a rocky shoal having 7 feet least water, with shoals all around. The SE. end of this reef is  $3\frac{1}{2}$  (4) miles S. by E.  $\frac{1}{2}$  E. (S.  $19^{\circ} 41'$  E.) from Beaver Tail Point, and  $6\frac{1}{2}$  ( $7\frac{1}{2}$ ) miles WSW.  $\frac{1}{2}$  W. (S.  $70^{\circ} 18'$  W.) from Point St. Vital. The reef extends one ( $1\frac{1}{2}$ ) mile northwesterly with deep water between the shoal patches. It is a menace to navigation as it lies nearly in the track of vessels bound from Detour Passage to the channel between Mackinac and Round islands.

Between Martin Reef and the mainland, in a northwesterly direction, are Tobin Reef, Surveyors Reef, and other patches with channels between. None of these channels should be attempted by strangers.

**Buoy.**—A first-class can buoy, painted black, is moored off the SE. end of Martin Reef in 20 feet of water. Vessels should pass south of this buoy.

**Coast.**—Between Beaver Tail Point and Point Fuyards,  $8\frac{1}{2}$  (10) miles to the westward is a large indentation in which are several large and small islands, the principal of which are Strong, Boot, Ile la Salle, and Ile Marquette, the latter a large island with Marquette Bay on its NW. side. Amongst these islands are many inlets (Scammon Harbor being the largest), but on account of offlying shoals they are practically useless, except for small craft.

**Goose Island**,  $2\frac{1}{2}$  ( $2\frac{1}{2}$ ) miles WSW. of Point Fuyards is surrounded by shoals; a reef extending for over one mile SSE. from its SE. end. From the eastern side, shoals extend out  $\frac{1}{2}$  mile with deep water between them and Marquette Island. From the western side, shoals extend off nearly  $\frac{1}{4}$  mile westerly and southwesterly; this side of the island should not be approached within a mile.

**Reef.**—At  $2\frac{1}{2}$  (3) miles SW. by W.  $\frac{1}{2}$  W. (S.  $61^{\circ} 52'$  W.) from Goose Island is a 6-foot patch with a 9-foot patch a short distance north of it. This reef is  $\frac{1}{2}$  mile long north and south, and  $\frac{1}{3}$  mile in breadth, being nearly circular in shape. It should be carefully avoided in navigating this part of the Straits.

**Point Brulée.**—Between the NW. shore of Ile Marquette and Point Brulée is an indentation forming Marquette and other bays; at the head of Marquette Bay is the village of Hessel. There is deep water in these bays, with many shoal spots, and they are only suitable for small craft.

**Search Bay.**—West of Point Brulée the shore recedes, forming Search Bay, open to the southward, its western boundary being Point St. Martin. The bay has deep water, no offlying dangers, and would serve as a shelter from northerly winds.

**Point St. Martin** is steep-to and has a deep-water channel between it and a rocky shoal extending east and west one ( $1\frac{1}{2}$ ) mile in a direction parallel to the face of the point.

**St. Martin Bay.**—Between Point St. Martin and Gross Point is St. Martin Bay, a large bay free from shoals and with deep water. It is protected from all winds from east to south by way of north, and from SE. winds partially by Ile St. Martin and Grosse Ile St. Martin. Between these islands and the mainland are three channels into the bay, all having deep water. There are several rivers flowing into this bay at its head, the largest being the Pine and Carp rivers.

**Ile St. Martin**, circular in shape, over a mile in diameter, lies  $1\frac{1}{4}$  ( $1\frac{1}{2}$ ) miles to the westward of Point St. Martin, the channel between being perfectly safe if a mid-channel course is kept.

From the south and SW. sides of this island, shoal water extends out for nearly a mile, and these sides of the island should be given a good berth in rounding it; the rest of the island is steep-to.

**Grosse Ile St. Martin** is nearly  $1\frac{1}{4}$  (2) miles long NNW. and SSE. and  $1\frac{1}{4}$  ( $1\frac{1}{2}$ ) miles broad at its widest part. Shoals extend off  $\frac{1}{2}$  mile from the several points of the island. The channel between the islands is deep and safe. A course should be kept a little nearer to Ile St. Martin after passing the shoals extending from that island. This course will clear the spit extending  $\frac{1}{2}$  mile off the low east point of Grosse Ile St. Martin.

The channel west of Grosse Ile St. Martin is also deep and safe in mid-channel. Shoal water extends to the eastward from Gross Point and to the westward from the NW. point of Grosse Ile St. Martin.

**Coast.**—Between Gross Point and Rabbits Back peak,  $3\frac{1}{2}$  (4) miles to the southward, the coast recedes, forming a bay open to the eastward; south of the peak is a small bight of shoal water, open to the SE., thence the coast trends SSE. for  $3\frac{1}{2}$  (4) miles to Point St. Ignace, with East Moran Bay, which is small and open to the eastward,  $1\frac{1}{4}$  ( $1\frac{1}{2}$ ) miles NW. of the point.

**St. Ignace** is on this bay, and projecting into the bay are several railroad docks.

**Graham Shoals.**—North Graham lies  $\frac{1}{4}$  mile SSE. of Point St. Ignace, and has a least depth of 8 feet. South Graham lies  $\frac{1}{4}$  mile SSW. of North Graham and  $1\frac{1}{4}$  ( $1\frac{1}{2}$ ) miles south of Point St. Ignace, and has a least depth of 6 feet. There is a channel between the shoals and Point St. Ignace, but it should not be attempted.

**Currents.**—The currents in the vicinity of Graham Shoals and in the Straits of Mackinac are often strong and irregular. After fresh gales, vessels anchored in the Straits often tail to windward.

**Buoys.**—A second-class can buoy, painted red, is moored in 15 feet of water on the south side of the center of North Graham Shoal.

A first-class automatic bell buoy, painted red, is moored on the southeasterly edge of South Graham Shoal in 24 feet of water. Vessels should pass south of this buoy.

**Coast.**—From Point St. Ignace the coast trends WSW. for  $2\frac{1}{2}$  ( $2\frac{3}{4}$ ) miles to Point la Barbe, thence it changes its direction to the NW. for  $2\frac{1}{2}$  (3) miles to West Moran Bay. All this coast is bordered with shoals and should not be approached within a mile.

From West Moran Bay the coast is bluff, bending to the northward as far as Gros Cap, and is steep-to; thence it takes a northwesterly direction for  $3\frac{1}{2}$  (4) miles to Point aux Chênes, becoming low and broken by inlets, with shoal water extending off some distance. From Point aux Chênes the coast trends northwesterly into Lake Michigan.

**St. Helena Island** lies  $1\frac{1}{2}$  ( $1\frac{3}{4}$ ) miles off the bluff, between West Moran Bay and Gros Cap. It is about a mile long NE. and SW. but shoal water extends from its SE. side for nearly  $\frac{3}{4}$  mile, its outer extreme being marked by a

**Buoy.**—On the SE. end of a shoal extending southeastward from St. Helena lighthouse, a 25-foot spar buoy, painted black, is moored in 18 feet of water. In entering St. Helena Harbor from the westward, give this buoy a berth of 100 yards.

There is deep water between the mainland and this island.

**Light.**—On the SE. point of St. Helena Island is a white conical tower, 65 feet high, connected by a covered way with a red dwelling, having a red roof. From this tower a fixed red light is shown, visible 14 ( $16\frac{1}{4}$ ) miles.

This light is a guide to vessels making a lee under St. Helena Island, and also a leading mark to vessels bound to the westward through the south channel of the Straits of Mackinac.

**Caution.**—Do not attempt to round the northwestern end of this island at night, unless its appearance under Gros Cap and the position of St. Helena Shoal are well defined and understood.

**St. Helena Shoal** is  $1\frac{1}{2}$  ( $1\frac{3}{4}$ ) miles west of the northwestern end of St. Helena Island, with deep water between, and with from 8 to 15 feet of water over it.

The shoal is 750 yards in extent NW. and SE., and 500 yards NE. and SW., with 8 feet on its shoalest (southeastern) edge. The soundings are irregular, bottom rocky, with from 3 to 4 fathoms close-to. On the south side of the shoal is a

**Buoy.**—A second-class can buoy, painted in red and black horizontal stripes, marks the southern edge of the shoal.

#### SOUTH SHORE.

From the NE. point of the lower peninsula of Michigan to Cheboygan lighthouse the coast takes a general WNW. direction for about  $8\frac{1}{2}$  (10)

miles, and can be approached to  $\frac{1}{2}$  mile. West of the lighthouse is McLeod Bay, extending to the SE., but almost filled with shoals having deep-water channels amongst them.

In the western part of the bay shoal water extends a mile off shore. There is an 11-foot patch  $\frac{1}{2}$  mile NW. by W. (N.  $56^{\circ} 15'$  W.) from the Crib light, and a 3-foot rock one ( $1\frac{1}{2}$ ) mile NW. by W.  $\frac{3}{4}$  W. (N.  $60^{\circ} 28'$  W.) from the same light.

**Buoy.**—At  $\frac{1}{4}$  mile NNE. of Cheboygan lighthouse is Cheboygan Shoal with but  $14\frac{1}{2}$  feet of water over it. A second-class nun buoy, painted black, is moored in 16 feet of water on the northern side of the shoal, and should be left to the southward in passing it.

**Lights.**—On the north point of the land to the eastward of McLeod Bay is Cheboygan light station, a square tower, 33 feet high, rising from a dwelling from which is shown a fixed white light, varied by a white flash every minute, and visible  $11\frac{1}{2}$  (13) miles.

**Fog Signal.**—The fog signal at this station is a 10-inch steam whistle giving a blast of 5 seconds, followed by a silent interval of 25 seconds. The fog-signal building is NE. of the lighthouse.

**Light.**—On an isolated crib off the west side of the dredged channel into Cheboygan River, is an octagonal tower  $26\frac{3}{4}$  feet high, from which is shown a fixed red light, visible  $11\frac{1}{2}$  (13) miles. Vessels bound to Cheboygan should pass the crib close-to and then take the range.

**Cheboygan Range Lights** are on the west side of the Cheboygan River on the prolongation of the center line of the cut and form a range for passing through the cut.

The front light is 42 feet above the lake level, shown from a square tower rising from a frame dwelling.

The rear light is 68 feet above the lake level, exhibited from an open framework tower. The lights are fixed red, visible  $7\frac{1}{2}$  ( $8\frac{1}{2}$ ) miles, and the towers are 1,112 feet apart. The range is SSW.  $\frac{7}{8}$  W. (S.  $32^{\circ} 20'$  W.).

**Cheboygan** is at the mouth of the Cheboygan River, which drains an area of 850 square miles and empties into McLeod Bay, locally known as Duncan Bay. The locality is a heavy lumber-producing district, and its water traffic is important.

**Improvements.**—A channel 200 feet wide and 15 feet deep has been dredged from the 15-foot curve to the State road bridge, marking the upper limit of improvement. This channel has somewhat filled, and it is now contemplated to increase its depth to 18 feet, and extend the outer limit to the 18-foot curve. January, 1894, the available depth was about 13 feet.

A timber crib 40 feet square was built in 1881 on the north side of the entrance in 16 feet of water to mark the exact position of the cut and to serve as a guide for entering it. The crib is used as a foundation for the lighthouse previously described.

**Directions.**—When a mile off the crib light, make the range on a course SSW.  $\frac{1}{8}$  W. (S.  $32^{\circ} 20'$  W.) and stand in.

**Cheboygan to Lake Michigan.**—Stand out with range lights or towers astern, in line, SSW.  $\frac{1}{8}$  W. (S.  $32^{\circ} 20'$  W.) until  $\frac{1}{2}$  mile outside of the crib light, when change course to NW. by W. (N.  $56^{\circ} 15'$  W.) and continue this course for  $13\frac{1}{2}$  ( $15\frac{1}{2}$ ) miles, when Mackinac light should be abeam, distant  $1\frac{6}{10}$  mile; then change course to W.  $\frac{1}{8}$  N. (N.  $88^{\circ} 36'$  W.) for  $15\frac{1}{2}$  ( $17\frac{1}{2}$ ) miles, which should bring a vessel abeam of Waugoshance light, distant  $\frac{3}{4}$  mile; thence to port of destination.

**Cheboygan to Presque Ile.**—Stand out with range lights or towers astern, in line, SSW.  $\frac{1}{8}$  W. (S.  $32^{\circ} 20'$  W.) until  $1\frac{1}{4}$  ( $1\frac{1}{2}$ ) miles from the crib light, when change course to east for  $6\frac{1}{2}$  ( $7\frac{1}{2}$ ) miles, passing  $\frac{1}{4}$  mile to the northward of Cheboygan Shoal buoy; thence change course to SE. by E.  $\frac{1}{4}$  E. (S.  $64^{\circ} 41'$  E.) for 45 ( $51\frac{1}{2}$ ) miles, which will take a vessel off Presque Ile; thence to port of destination.

**Cheboygan to Detour Passage.**—Stand out with range lights astern, in line, SSW.  $\frac{1}{8}$  W. (S.  $32^{\circ} 20'$  W.) until  $\frac{1}{2}$  mile from the crib light, when change course to NE. by E.  $\frac{1}{8}$  E. (N.  $63^{\circ} 16'$  E.) for  $14\frac{1}{2}$  ( $16\frac{1}{2}$ ) miles, passing SE. of Poe Reef lightvessel; this should bring a vessel abeam of Spectacle Reef light; thence NE.  $\frac{1}{8}$  E. (N.  $49^{\circ} 24'$  E.) for  $14\frac{1}{2}$  ( $16\frac{1}{2}$ ) miles will take a vessel off the entrance to Detour passage, with the buoy on range with Detour Point light, and distant  $\frac{1}{2}$  mile.

It is not advisable to pass between Poe Reef lightvessel and Bois Blanc Island, except for vessels of light draft.

**Coast.**—From Cheboygan the coast trends northwesterly for 13 (15) miles to Mackinac City, and it is safe to keep it at a distance of a mile. The 4-fathom curve, excepting off the mouth of the Cheboygan River, in the western part of McLeod Bay, is not more than  $\frac{1}{4}$  mile off shore, but it generally follows the shore at about  $\frac{1}{2}$  mile.

A little NW. of Point au Sable,  $4\frac{3}{4}$  ( $5\frac{1}{2}$ ) miles NW. of Cheboygan Crib light, and at the village of Freedom,  $3\frac{1}{2}$  (4) miles further on, the edge of the curve is  $\frac{3}{4}$  mile off shore.

**Mackinac City**, on Old Point Mackinac, is an open roadstead and only protected from NW. winds. The best anchorage for small craft is about  $\frac{1}{2}$  mile off shore, SE. of the railroad pier.

**Light.**—On Old Point Mackinac a light, flashing red every 10 seconds, is shown and should be visible, in clear weather,  $13\frac{1}{2}$  ( $15\frac{1}{2}$ ) miles.

The lighthouse is a cylindrical tower, 50 feet high, and forms the NW. corner of the keeper's dwelling, both built of buff brick. Roof of dwelling red; lantern black. Fog-signal house 80 feet east of tower; brown.

**Fog Signal.**—A 10-inch steam whistle gives blasts of 5 seconds' duration, with alternate silent intervals of 17 and 33 seconds.

**McGulpin Point** is  $1\frac{1}{4}$  (2) miles to the westward of Old Point Mackinac, the shore between forming a shallow bight, with shoal water, open to the northward. The point is a bluff, steep-to, and faces the NW. for over a mile. On the north extremity of the point is a

**Light.**—The light is fixed white, visible 16 ( $18\frac{1}{2}$ ) miles.

The lighthouse, on a bluff 70 feet above the lake level, is an octagonal tower, attached to the NW. corner of the dwelling, both yellow with red roofs.

The light is a guide through the Straits.

**Coast.**—From the SW. extremity of McGulpin Point, the shore recedes to the southeastward for a mile, then trends SW. for 2 ( $2\frac{1}{4}$ ) miles, and then NW. for a mile, forming a bay 2 ( $2\frac{1}{4}$ ) miles wide and a mile deep, with shoal water extending out from the shore for over  $\frac{1}{2}$  mile.

This bay affords protection from all winds except those from north to west. From the SW. point of this bay the coast takes a general westerly direction for 8 ( $9\frac{1}{4}$ ) miles to Waugoshance Point, with two shallow bights open to the NW.

This part of the coast should not be approached within a mile, and as the extremity of Waugoshance Point is neared, a still wider berth should be given it.

#### WAUGOSHANCE POINT, ISLAND, AND SHOALS.

**Waugoshance Point**, a long, low, and narrow point, extends out from the mainland for  $1\frac{1}{4}$  (2) miles and is further continued by several small islets. The point is the top ridge of a long shoal which extends out from the mainland for  $5\frac{1}{2}$  ( $6\frac{1}{4}$ ) miles to Waugoshance lighthouse, the shoal having a mean breadth of  $1\frac{1}{4}$  (2) miles. Waugoshance Island,  $1\frac{1}{4}$  (2) miles westward of the extremity of the point, is a mile long east and west and  $\frac{1}{2}$  mile broad.

**Caution.**—In rounding Waugoshance shoal, do not pass between Waugoshance lighthouse and the island; keep a lookout for Vienna Shoal, and give it a good berth.

**Waugoshance Lighthouse** is on the northwestern end of Waugoshance Shoal, 2 miles NW. of Waugoshance Island.

The light is fixed white, varied by a flash every 45 seconds and is visible  $14\frac{1}{4}$  ( $16\frac{1}{2}$ ) miles.

The lighthouse, 65 feet high, is an iron tower, with a dwelling and a fog-signal building, all surrounded by a square crib. The buildings are painted red and white in alternate horizontal bands. The light marks Waugoshance Shoal and the turning point into Lake Michigan.

**Fog Signal.**—The fog signal is a 10-inch steam whistle, giving blasts of 5 seconds' duration, followed by a silent interval of 25 seconds.

**Waugoshance Sixteen-Foot Shoal** is  $1\frac{1}{4}$  ( $1\frac{1}{2}$ ) miles NW. of Waugoshance light, and on a line between this light and White Shoal lightvessel, and nearly on a line between St. Helena lighthouse and Grays Reef lightvessel.

These ranges will be useful in rounding this shoal at night. The shoal is marked by a

**Buoy.**—A second-class nun buoy, painted black, moored in 23 feet of water. A half mile eastward of this buoy is an 18-foot patch. These patches are known as Rose Shoal.

**Vienna Shoal** is  $1\frac{1}{4}$  ( $1\frac{1}{2}$ ) miles WSW.  $\frac{1}{2}$  W. of Waugoshance lighthouse; it is 300 yards in length from east to west and 175 yards from north to south, with a least depth of 13 feet. The NW. point of the shoal is marked by a

**Buoy.**—A second-class can buoy, painted in red and black horizontal stripes, and moored in 18 feet of water.

**Grays Reef Lightvessel.**—Between Vienna Shoal and this lightvessel is a channel  $2\frac{1}{2}$  (3) miles wide, with deep water.

The lightvessel has two masts, is schooner rigged, showing a black oval cage-work day mark at the fore masthead, and a red one at the main. Hull red, bulwarks white, with "Grays Reef" in large black letters on each side, and "No. 57" on the stern. The lightvessel is moored in 20 feet of water off the easterly edge of Grays Reef.

A fixed white light is shown at the fore masthead, and a fixed red light at the main, each 30 feet above the water, and visible (white)  $9\frac{1}{4}$  ( $11\frac{1}{4}$ ) and (red)  $7\frac{1}{4}$  ( $8\frac{1}{2}$ ) miles.

**Fog Signal.**—The fog signal is a 6-inch steam whistle, which sounds as follows: Blast, 3 seconds; silent interval, 10 seconds; blast, 1 second; silent interval, 10 seconds; blast, 1 second; silent interval, 35 seconds.

**White Shoal Lightvessel,**  $3\frac{1}{2}$  (4) miles NE. by N. of Grays Reef lightvessel, is moored in 26 feet of water off the eastern edge of White Shoal.

The lightvessel has two masts, is schooner rigged, with a black, oval cage-work day mark at each masthead. The hull is white, with "White Shoal" in large black letters on each side, and "No. 56" on the stern.

A fixed white light is shown at each masthead; each being elevated 30 feet and visible  $9\frac{1}{4}$  ( $11\frac{1}{4}$ ) miles.

**Fog Signal.**—The fog signal is a 6-inch steam whistle, which sounds as follows: Blast, one second; silent interval, 10 seconds; blast, 1 second; silent interval, 10 seconds; blast, 3 seconds; silent interval, 35 seconds.

**Buoy.**—A first-class, 35-foot spar buoy, painted in red and black horizontal stripes, is moored at the SW. end of White Shoal in 18 feet of water.



## ISLANDS AND SHOALS IN STRAITS OF MACKINAC.

Under this heading will be considered the islands and shoals in the Straits which lie clear of the coast line, and which can not be considered as forming bounds to bays or harbors. They will be described from the eastward.

**Spectacle Reef.**—This reef lies 9 ( $10\frac{1}{2}$ ) miles east of the east point of Bois Blanc Island, and is almost in the track of ships bound from Detour Passage to the South Channel of Mackinac Straits. The reef is  $\frac{7}{8}$  mile long north and south, and  $\frac{1}{2}$  mile broad east and west, with a least depth of 8 feet, on its southern part. On the northwestern edge of the reef from a square crib is shown a

**Light.**—The light is flashing red and white, alternately, every 30 seconds, and is visible 15 ( $17\frac{1}{2}$ ) miles.

The lighthouse is a conical, gray tower, 97 feet high, with dome and railings painted black, surrounded by a square wooden crib on which are two white frame fog-signal houses, and a white frame boathouse.

This light serves as a guide to the Straits from the eastward.

**Fog Signal.**—The fog signal is a 10-inch steam whistle, giving blasts of 3 seconds, with alternate silent intervals of 12 and 42 seconds.

**Raynolds Reef,**  $3\frac{1}{2}$  ( $3\frac{3}{4}$ ) miles to the westward of Spectacle Reef is a dangerous shoal with from 12 to 13 feet of water over it. It should not be approached nearer than  $\frac{1}{2}$  mile. Its northern edge is marked by a

**Buoy.**—A second-class can buoy, painted in red and black horizontal stripes, is moored in 17 feet of water, and marks this shoal.

**Poe Reef** is  $1\frac{1}{2}$  ( $1\frac{7}{8}$ ) miles from the SE. end of Bois Blanc Island. The reef extends east and west 2,000 yards, with a least depth of 12 feet of water over it. There is a narrow channel north of it, which should not be attempted by strangers.

On the eastern end of this reef, to mark the north side of South Channel, in 41 feet of water, is moored a

**Lightvessel.**—The vessel shows simultaneously from three lens lanterns encircling the fore masthead a fixed white light. The light is 40 feet above the lake level, and is visible  $11\frac{1}{2}$  ( $13\frac{1}{2}$ ) miles. The vessel has two masts, is schooner rigged, without a bowsprit. There is a circular black cage-work day mark at the fore masthead, with a small black smokestack, and the fog signal between the masts. The hull is red, with "Poe Reef" in large white letters on each side, and "No. 62" on each bow.

**Fog Signal.**—A 6-inch steam whistle sounds blasts of 5 seconds' duration, separated by silent intervals of 10 seconds. If the whistle be disabled, a bell will be rung by hand.

**Bois Blanc Island** forms the north boundary to the South Channel, Straits of Mackinac. Its greatest length is  $9\frac{1}{2}$  (11) miles WNW. and

ESE., and its breadth for half this distance is 4 ( $4\frac{1}{2}$ ) miles, narrowing to a mile at its northwestern end.

About  $2\frac{1}{2}$  ( $2\frac{1}{2}$ ) miles from its eastern end a narrow peninsula extends out from the northern shore northerly for  $1\frac{1}{2}$  ( $1\frac{1}{2}$ ) miles, tapering at its northern edge to a breadth of but  $\frac{1}{4}$  mile. On the NE. point of this peninsula is a

**Light.**—The light is fixed white, 53 feet above the lake level, and visible  $12\frac{1}{2}$  ( $14\frac{1}{2}$ ) miles.

The lighthouse is a square tower, 38 feet high, on a yellow dwelling.

The lighthouse serves as a guide into the channel between Round and Mackinac islands.

**Shoal.**—NW. of the light,  $\frac{1}{10}$  mile, is a shoal with 17 feet of water over it.

**Life-Saving Station.**—Bois Blanc Station is about half way between the east and SE. points of the island.

**Coast of the Island.**—From the peninsula, the coast of the island trends ESE. for  $2\frac{1}{2}$  ( $2\frac{1}{2}$ ) miles, and is safe to approach to  $\frac{1}{2}$  mile. Shoal water extends off the east point of the island for nearly  $\frac{1}{2}$  mile and follows the southeastern side at this distance until off the SE. point, when it extends off as a spit for a mile. From the southern edge shoals extend off for nearly  $\frac{1}{4}$  mile, closing in to  $\frac{1}{4}$  mile at the point where the southern coast changes its direction to the northwestward. The shoal water follows the trend of the coast to the NW. end of the island except at

**Zela Shoal.**—Half way between the NW. and SW. ends of Bois Blanc Island a narrow spit extends out northwesterly for  $1\frac{1}{2}$  (2) miles from Zela Point and is marked on its extreme NW. end by a

**Buoy.**—A third-class can buoy, painted red. There is no channel between this buoy and the island.

The northern shore of the island for  $3\frac{1}{2}$  ( $3\frac{1}{2}$ ) miles from the north point has shoal water extending out for  $\frac{3}{4}$  mile, and Bois Blanc is connected with Round Island by shoals. A rocky shoal of 3 feet lies almost on the edge of the 4-fathom curve about one mile NE. of the north point with 76 feet close-to. This is a dangerous spot. About  $3\frac{1}{2}$  ( $3\frac{1}{2}$ ) miles to the eastward from the north point, the shore becomes steep-to and continues so to the end of the peninsula. The bight formed by the peninsula gives good protection from SE. winds.

**Round Island** is  $\frac{1}{2}$  mile from Bois Blanc Island, with which it is connected by shoals. Shoals extend eastwardly  $1\frac{1}{2}$  (2) miles from the southeastern side of the island.

The NW. point of the island extends in a long narrow point for  $\frac{1}{2}$  mile, with shoals on each side.

**Shoal.**—A 24-foot shoal extends  $1\frac{1}{2}$  (2) miles NE. from the extreme NW. point of Round Island almost to mid-channel.

**Major Shoal** lies  $2\frac{1}{2}$  ( $2\frac{1}{2}$ ) miles SW. by W. of the NW. point of Round Island.

The general direction of the shoal is NW. and SE. and it is 1,200 feet long. There is a least depth of 14 feet of water 400 feet SE. of the

**Buoy.**—A second-class can buoy, painted in red and black horizontal stripes, is moored in 19 feet of water on the middle of the shoal.

**Mackinac Island**, 2 ( $2\frac{1}{2}$ ) miles eastward of Point St. Ignace is  $2\frac{1}{2}$  (3) miles long and  $1\frac{1}{4}$  (2) miles broad. Its southern part, on which is the town and fort of Mackinac, forms the northern shore of the narrowest part of the Straits of Mackinac. The island is of importance as a military station.

**Mackinac.**—The town of Mackinac at the SE. end of the island is on the north channel of the Straits of Mackinac. Many large passenger and transient steamers stop here. The town is a coaling station, and is a great resort for invalids and tourists.

**Harbor.**—The harbor is between Biddle and Mission points. It is open to the southward and exposed to the wind from east or west, which often makes such a heavy sea that landing is impossible.

The water front of Fort Mackinac comprises nearly  $\frac{1}{3}$  of the water front of the whole harbor.

**Buoy.**—A third-class can buoy, painted red, is moored in 16 feet of water, at the end of a spit extending off from the SW. point of Mackinac Island. Vessels should pass south of it, and avoid the shoal off the NW. point of Round Island.

**Directions—From the Eastward.**—Steer for the middle of the passage until the docks are ranged, when haul up for them, giving the SE. point of the island a berth of  $\frac{1}{4}$  mile.

**From the Westward.**—Should the buoy off the SW. point of the island not be seen, open up Bois Blanc light a point on the starboard bow until the red light (private light) on the south pier bears north, when haul up for the docks.

For clearing the spit off the SW. point of the island, a good range is with the block house on Fort Mackinac on a line with the south pier head.

**Current.**—During the prevalence of strong easterly or westerly winds a strong current sets through the channel between these islands, sometimes as great as 6 or 8 knots an hour. In the harbor, inside the range of the points, the current is usually contrary to that in the passage and is caused by the eddy.

**Anchorage.**—Good anchorage is found in the harbor anywhere north of the range of the north pier, in from 3 to 5 fathoms of water. The docks extend out about 500 feet ESE. and have 16 feet of water at their outer ends.

There are no pilots, but tugs are available. Wharfage is charged at the rate of 5 cents per 100 pounds.

## CHAPTER II.

### LAKE HURON.

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Lake Huron is 263 miles long, 101 miles broad and has an area of 21,000 square miles, a maximum depth of 750 feet, and an altitude above the sea of 581.28 feet. The north and NE. shores of Lake Huron are mostly composed of sandstone and limestone, and where metamorphic rocks are found, the surface is broken and hilly, rising to elevations of 600 feet or more above the lake, unlike in this respect the southern shores skirting the peninsula of Michigan and southwestern Ontario, which are comparatively flat and of great fertility. Georgian Bay in the northeastern part of the lake lies entirely within the Dominion of Canada, whilst Thunder Bay on the west and Saginaw Bay on the SW. are in the State of Michigan. The chief tributaries of the lake on the United States side are Thunder Bay River, the Au Sable, and the Saginaw; on the Canadian side are the French River from Lake Nipissing, the Severn from Lake Simcoe, the Muskoka and the Nottawasaga, all emptying into Georgian Bay.

#### HARBORS OF REFUGE.

**Sand Beach**, 50 miles northward of the St. Clair River, on the Michigan side, is the only artificial harbor of refuge on the lake on the American side. Twenty-one feet can be taken in.

**Goderich, Canada**, E. by S. from Sand Beach, is also a harbor of refuge but only for vessels drawing less than 16 feet.

#### NAVIGATION.

As a rule, navigation opens in the middle of April and closes the middle of December.

The two great evils to navigation are fogs and snow. There are no tides and but light currents for the master to contend with on the lakes, and as these are the most uncertain of all elements for the navigator to calculate and allow for, it reduces very much the per cent of danger in lake navigation; hence, the safe navigation of the lakes is confined to a correct compass, with a knowledge and frequent use on the part of the master of the azimuth tables; the precaution to take cross bearings of prominent points and from them plotting the position frequently on the chart; also, the familiar use of the chart in laying courses and correcting the same for variation and deviation.

## DANGERS—UNITED STATES SHORES.

**Cheboygan Shoal**, *see* page 7.

**Poe Reef**, *see* page 11.

**Spectacle Reef**, *see* page 11.

**Raynolds Reef**, *see* page 11.

**Martin Reef** (north shore), *see* page 4.

**Tobin and Surveyors Reef** (north shore), *see* page 4.

**Straits of Mackinac to Thunder Bay**.—SE. of Adams Point one mile, and  $\frac{1}{2}$  mile off shore, is a 4-foot shoal.

E.  $\frac{3}{4}$  S. (S.  $81^{\circ} 33'$  E.) of Old Presque Ile lighthouse 1,000 yards is an extensive shoal of 9 feet, with 15 feet a short distance SE. of it.

In the first bight to the southward of Presque Ile Harbor are several patches of 5 feet and less. From the SW. point of False Presque Ile Harbor, flats and detached shoals extend off southeasterly for nearly  $1\frac{1}{2}$  (2) miles; the outer patch of 17 feet lying one ( $1\frac{1}{2}$ ) mile off shore.

Shoal water extends  $\frac{1}{2}$  mile southward from the SE. point of Middle Island and  $\frac{1}{4}$  mile from the remaining portions of the island.

One thousand yards from the SE. end of the island is a 3-foot patch surrounded by an extensive shoal; a buoy is moored eastward of the shoal.

Midway between Middle Island and the mainland is an extensive shoal, least water 6 feet, and SSW. and south of the west end of Middle Island are 16 and 17 foot patches.

**Thunder Bay**.—From Thunder Bay Island, shoals extend to the mainland and northwestward to Rond Island and the point north of it; shoals continue for 350 yards SE. from the SE. point of Thunder Bay Island. A wreck, steamer D. M. Wilson, lies  $1\frac{1}{2}$  (2) miles NE. from Thunder Bay Islands light.

From North Point shoals extend southeasterly one ( $1\frac{1}{2}$ ) miles; the SE. end of the shoals is marked by a buoy.

Off Grass Island at the head of Thunder Bay are two detached shoals at a distance of  $\frac{3}{4}$  and one ( $1\frac{1}{2}$ ) mile; the outer shoal is  $\frac{1}{2}$  mile long NW. and SE., with a least depth of 10 feet of water. SW. of this shoal is a small patch of 16 feet. Shoals extend off this part of the bay for over a mile.

Shoals connect Sulphur Island with the mainland and extend a mile northward from the island curving toward Partridge Point, from which a spit extends eastward for  $\frac{1}{2}$  mile. One ( $1\frac{1}{2}$ ) mile eastward of the north point of Sulphur Island is the north point of an offlying shoal, least water 13 feet, extending southeastward  $\frac{3}{4}$  mile. Between this shoal and the southern part of the island is a patch of 14 feet.

The southern portion of Thunder Bay is filled with shoals, which extend northward from South Point 3 ( $3\frac{1}{2}$ ) miles, the northern edge of which takes a general W. by N. direction to the mainland.

Between South Point and Black River Island the shore should not be approached within  $1\frac{1}{2}$  (2) miles.

**Black River Island to Point au Sable.**—Foul ground surrounds Black River Island; extends to the ENE.  $\frac{1}{2}$  mile from the island and connects the island with the shore. Rocky spots extend one ( $1\frac{1}{2}$ ) mile eastward from Black River. A spit extends nearly a mile ENE. from Sturgeon Point. Between Harrisville and Spring Mills, shoals extend off shore one mile.

Six (7) miles northward of Sable River, is a 9-foot spot one mile off shore.

**Saginaw Bay.**—Shoals surround Point au Sable to the distance of  $\frac{1}{2}$  mile, and fill up the small bight west of the point. The shore between Point au Sable and Tawas Point should not be approached within one mile.

**Tawas (Ottawa) Point** has a sand spit extending from it nearly a mile southwesterly and westerly. The SW. and NW. ends of this spit are marked by buoys.

The western shore of Tawas Bay has 18 feet of water a mile off shore. The shore from Tawas Bay to Gravelly Point should not be approached within a mile, especially off Mason Creek, where the shoals extend farther. From Gravelly Point shoals, least depth 11 feet, extend southeasterly  $2\frac{1}{2}$  ( $2\frac{1}{2}$ ) miles; the extreme southeastern edge of this shoal is marked by a buoy; a detached 17-foot patch is a short distance southward of the buoy.

The head of the bight within Gravelly Point is filled with shoals, with a 16-foot detached shoal in the northern part. The 3-fathom curve is nearly a mile eastward of Point aux Gres, and just outside of an 8-foot patch; from this patch the 3-fathom line curves SW. by S. to the head of the bay; outside of the line on the west side of the bay there are no dangers.

Off the mouth of the Saginaw River the 4-fathom curve is  $3\frac{1}{2}$  ( $3\frac{1}{2}$ ) miles off shore. A shoal with 16 feet of water, and extending east and west nearly a mile, lies  $4\frac{1}{2}$  ( $4\frac{1}{2}$ ) miles NNE. of the mouth of the Saginaw River; it is a mile outside of the 3-fathom curve.

The whole south and east sides of Saginaw Bay to Sand Point are filled by a flat which extends from the eastern shore 7 (8) miles. From Sand Point the flat continues northerly, filling up the eastern entrance to the bay, to Little Charity and Charity islands, surrounding these islands and extending in all directions from Charity Island  $1\frac{1}{2}$  (2) miles. It is marked on its northwestern edge by a buoy.

Between Sand point and Pointe aux Barques, flats and shoals extend off from one to 2 miles.

Off Partridge River is a shoal, least water 5 feet, extending north and south for over a mile.

A reef extends to the NW. from Pointe aux Barques  $1\frac{1}{2}$  ( $1\frac{1}{2}$ ) miles.

**Pointe Aux Barques to Pointe Aux Barques Lighthouse.**—There are ledges and detached rocky spots, rendering the coast dangerous  $1\frac{1}{2}$  ( $1\frac{1}{2}$ )

miles from the shore. Orion rock, with 6 feet of water over it, lies one ( $1\frac{1}{2}$ ) mile NW. of Willow River wharf. There is a 2-foot spot  $\frac{1}{2}$  mile east and an 8-foot spot one ( $1\frac{1}{2}$ ) mile NNE. of Pointe aux Barques lighthouse. Reefs extend to the eastward 2 miles from the light; their outer edge is marked by a buoy.

**Pointe Aux Barques Lighthouse to Fort Gratiot Lighthouse.**—

Between Pointe aux Barques light and Forest Bay, boulders and rocky spots are found within  $\frac{1}{2}$  mile from shore. There are several dangerous ledges running north and south, a mile from shore, off Forest Bay. At Elm Creek a dangerous spit extends NE.  $\frac{3}{4}$  mile. Rocky spots are found from here on to Indian Creek  $\frac{1}{2}$  mile off shore. From Indian Creek to Fort Gratiot light the coast can generally be approached to  $\frac{1}{2}$  mile, excepting  $\frac{3}{4}$  mile NE. of Burchville, where there is a detached rocky shoal with 17 feet over it.

DANGERS—CANADIAN SHORE.

**Detour Reef**,  $\frac{3}{4}$  mile SE. by E.  $\frac{1}{2}$  E. (S.  $59^{\circ} 04' E.$ ) from Point Detour lighthouse is marked by a buoy. There are several shoals off the SW. point of Fair Island and between it and the buoy. The south shore of Drummond Island should be given a berth of at least a mile as there are many detached shoals.

**Magnetic Reefs** lie in the western entrance to the Strait of Mississauga. There is a detached rock on the eastern side of the entrance on a line joining the south point of Cockburn Island and the west point of Green Island  $2\frac{1}{2}$  ( $2\frac{3}{4}$ ) miles from the latter. Reefs extend from Green Island to Grand Manitoulin Island.

**Duck Islands.**—Reefs extend for over a mile to the southward from the southern ends of Great Duck and Outer Duck islands. There is a detached reef  $\frac{3}{4}$  mile north of Great Duck Island.

Middle Duck Island is surrounded by reefs. Inner Duck Island is also surrounded by reefs and from its northern end reefs extend almost to Grand Manitoulin Island.

**Grand Manitoulin Island.**—There are several detached reefs off the southern part of this island, a mile off shore.

**Michael Point** has a long, narrow reef extending westward for over 2 ( $2\frac{1}{2}$ ) miles. The light between Michael and Walker points is filled with reefs which extend  $1\frac{1}{2}$  ( $1\frac{3}{4}$ ) miles off shore.

**Owen Channel** is blocked by shoals.

**Fitz William Channel**, between Fitz William and Yeo islands, has a 12-foot shoal in mid-channel.

**Main Channel into Georgian Bay.**—There are several shoals just within the entrance, for a full description of which see supplement.

**Bad Neighbor Rock**, with 3 feet of water over it, lies almost in mid-channel between Yeo and Cove islands. Two small patches of 11 feet lie SW. 200, and S. by W. 400 yards from the rock. The south end of the shoal is marked by a black spar buoy.

The channel between Cove Island and Cape Hurd is almost closed by reefs extending northward from the cape; a long reef extending westward from Russel Island and southwestward from Cove Island.

**From Cape Hurd to Chantry Island** the coast is rocky, and north of Lyal Island should not be approached within 2 ( $2\frac{1}{4}$ ) miles; south of Lyal Island, in the neighborhood of the Ghegheto Islands, a much wider berth should be given the shore. The coast continues the same rocky character to Point Clark. A reef extends westward from Point Clark  $1\frac{1}{2}$  ( $1\frac{3}{4}$ ) miles, and 3 ( $3\frac{1}{2}$ ) miles south of Point Clark is a similar reef.

**From Point Clark to Cape Ipperwash** the coast is less dangerous and can be approached to  $\frac{3}{4}$  mile.

At Cape Ipperwash a dangerous ledge extends northward  $1\frac{1}{2}$  ( $1\frac{3}{4}$ ) miles, and between Cape Ipperwash and Point Harris are boulders and rocky spots within a mile of the shore.

**From Point Harris to the St. Clair River** the coast is bold and may be approached to  $\frac{1}{2}$  mile.

#### THE COAST.

The north shore of the lake from Point Detour westward is described in Chapter I, Straits of Mackinac. The routes east, west, and south from Point Detour are given in the same chapter, as also is a description of Cheboygan and the routes from it.

#### WEST SHORE.

From Cheboygan to the NE. point of the Lower Peninsula of Michigan the coast trends ESE. for  $8\frac{1}{4}$  (10) miles, and can be approached to  $\frac{3}{4}$  mile. The coast then changes direction to SE. by S. for  $6\frac{1}{2}$  ( $7\frac{1}{2}$ ) miles to the NW. point of

**Hammond Bay**, which is  $5\frac{1}{4}$  (6) miles wide between its NW. point and Forty Mile Point, and  $1\frac{3}{4}$  (2) miles long. There are no dangers, and it affords shelter from all winds from east to NW. by way of south. The Oqueoc River empties into this bay. There is a

**Life-Saving Station** at Forty Mile Point.

From Forty Mile Point the coast trends east  $5\frac{1}{4}$  (6) miles and SE.  $5\frac{1}{4}$  (6) miles to the mouth of the Trout River, eastward of which is

**Rogers City.**—This is an open roadstead. There are three piers, 500 feet apart, at which wharfage is charged at the rate of 50 cents per ton. There are no tugs or pilots.

**Display Station.**—The United States Weather Bureau has a special Display Station at Rogers City.



**Directions.**—The center wharf has the best water. Bring this wharf to bear WSW.  $\frac{1}{2}$  W. (S.  $73^{\circ} 07' W.$ ) and run in for it.

Four miles eastward of Rogers City is the mouth of the Swan River, which offers shelter for small craft in all southerly winds, and just beyond is Adams Point, where the coast again trends southwestward to the Peninsula of Presque Ile. One mile SE. of Adams Point is a 4-foot shoal.

**Presque Ile Peninsula** is  $1\frac{1}{2}$  ( $1\frac{1}{2}$ ) miles long NW. by N. and SE. by S. Shoals extend from both sides of the peninsula for over  $\frac{1}{4}$  mile, and nearly  $\frac{1}{2}$  mile east of the old light tower, on the south point of the island, are only 12 feet of water. The bay westward of Presque Ile affords shelter from southerly winds, but the bottom is of rock. Near the north end of the peninsula is a

**Light.**—A fixed white light, visible  $17\frac{1}{2}$  ( $19\frac{1}{2}$ ) miles in clear weather, near the north end of the peninsula, is shown 123 feet above the lake level from a conical white tower 100 feet high, connected with a yellow dwelling by a covered way.

It marks the turning point when bound through the Straits of Mackinac.

**Fog Signal.**—A 10-inch steam whistle, giving blasts of 5 seconds, followed by silent intervals of 25 seconds.

The fog-signal house is on the beach  $\frac{1}{4}$  mile N. by W. of the light.

**Presque Ile Harbor**, south of the peninsula, forms a snug anchorage for small vessels. A bar with 14 feet, greatest depth, closes the harbor; inside the bar, in the center of the harbor, is a space  $\frac{1}{8}$  mile in diameter of 20 feet depth; the rest of the bay is shoal.

**Shoal.**—There is a 9-foot shoal 1,000 yards E.  $\frac{1}{4}$  S. (S.  $81^{\circ} 33' E.$ ) from the old light tower.

This shoal is surrounded by 15 feet of water, and the same depth extends southeastward 200 yards.

**Range Lights.**—Two fixed white lights visible (front)  $9\frac{1}{2}$  ( $10\frac{1}{2}$ ) and (rear)  $11\frac{1}{2}$  (13) miles.

The front light tower, white, is on the west shore of the harbor, and the light is shown 18 feet above the lake level.

The rear light is 36 feet above the lake level, on a white dwelling 1,000 feet W.  $\frac{3}{8}$  N. (N.  $85^{\circ} 46' W.$ ) from the front light.

**Directions.**—When in a depth of 7 fathoms, come on the range W.  $\frac{3}{8}$  N. (N.  $85^{\circ} 46' W.$ ) and run in. This will take a vessel across the bar in the deepest (14 feet) water. When the old lighthouse bears NNE. (N.  $22^{\circ} 30' E.$ ) haul a short distance to the southward or northward of the range and anchor in 3 or  $3\frac{1}{2}$  fathoms of water. The anchorage is good in any weather.

To the southeastward of Presque Ile Harbor is a small bight with several shoals of 5 feet and less; the most outlying, 5 feet, is 500 yards north of the south point of this bight, and 1,200 yards off shore. As it lies almost

on the edge of the 4-fathom curve, vessels should give the locality a wide berth.

From this bight the coast continues SE. 4 miles to False Presque Ile and can be approached to  $\frac{1}{2}$  mile, as also can the east and south coasts of False Presque Ile. A spit extends ENE. from the south point of the island 1,200 yards, and another SSE. 500 yards. Just south of False Presque Ile is

**False Presque Ile Harbor.**—The head of this harbor extends inland  $\frac{3}{4}$  mile, but is filled with flats; flats also extend one ( $1\frac{1}{2}$ ) mile southeastward and  $\frac{1}{2}$  mile off shore from the SW. point of the harbor. Three hundred yards SE. from the end of this spit is an extensive outlying shoal with a least depth of 12 feet. East of the south end of this shoal nearly 600 yards, is a detached spot of 17 feet, and south of the shoal 300 yards is a detached spot of 16 feet.

All of these shoals are avoided by keeping within  $\frac{1}{2}$  mile of the north shore of the harbor.

**Directions.**—Run in on a NW. course, keeping  $\frac{1}{2}$  mile from the north shore of the harbor, and anchor in about 3 fathoms, or smaller craft will find a snug berth farther in, in  $2\frac{1}{2}$  fathoms. Good shelter is found here from all winds excepting those between south and east.

**Middle Island** lies  $1\frac{1}{2}$  miles off shore,  $4\frac{1}{2}$  (5) miles SE. of False Presque Ile Harbor. It is a mile long NW. and SE., and nearly  $\frac{3}{4}$  mile NE. and SW. A spit extends southward from the SE. point of the island for over  $\frac{1}{2}$  mile, and the island is generally surrounded by shoals to the distance of  $\frac{1}{2}$  mile, except the north and NE. sides, which are rather more steep-to.

**Life-Saving Station** is on the NW. point of the island.

**Display Station.**—The United States Weather Bureau has a special display station on Middle Island.

**Shoals.**—Midway between Middle Island and the mainland is an extensive shoal with a least depth of 6 feet, and SW. of the island are several patches of 16 and 17 feet.

ESE. 1,000 yards from the SE. point of the island is a 3-foot patch in the middle of an extensive shoal, the NE. point of which is a mile eastward of the south point of the island. Discolored water marks this shoal in calm, and breakers in rough weather. The shoal is marked on its eastern edge by a

**Buoy.**—A second-class nun buoy, painted red, and moored in 20 feet of water.

**Anchorage.**—The island affords a lee in all winds and there is good holding ground under the south side of the island.

**Directions.**—To anchor between the island and the mainland, vessels from the northward must pass  $\frac{1}{2}$  mile outside of the buoy and when it is in range with the SE. point of the island haul up to WSW.  $\frac{3}{4}$  W. (S.

75° 56' W.) and when the west point of the island bears N. by W. (N. 11° 15' W.) haul up for it and anchor in 4 or 4½ fathoms about ½ mile from the island.

**The Coast** from Presque Ile Harbor to North Point trends southwestwardly 14¼ (17) miles. North of North Point the shore trends to the westward, forming a large bight filled with a flat and shoals. In this bight are Rond and Crooked islands, and several smaller ones. The flat extends eastward 3 miles; on the northern part of it is Gull Island, ¼ mile south of Gull Island is Sugar Island, and on the eastern edge of the flat is Thunder Bay Island, one (1¼) mile long NW. and SE., with an average breadth of ¼ mile. The flat continues 300 yards southeastward from the SE. point of the island. Near the SE. part of the island is a

**Light.**—A flashing white light every 90 seconds, visible 13¼ (15½) miles in clear weather, is shown 59 feet above the lake level, from a conical, yellow tower, connected with a yellow dwelling by a covered way.

**Fog Signal.**—A 10-inch steam whistle gives a blast of 8 seconds duration, followed by a silent interval of 10 seconds, then a blast of 2 seconds and a silent interval of 40 seconds.

The fog-signal-house is SSE. of the lighthouse.

**Wreck.**—A wreck, steamer D. M. Wilson, which is an obstruction to navigation, lies 1¼ (2) miles NE. from Thunder Bay Island light. Lights will be hung on the spars when weather permits.

**Life-Saving Station.**—The Life-Saving Station is on the SW. point of the island ¼ mile from the lighthouse.

**Display Station.**—The United States Weather Bureau has a special display station on the island.

**Anchorage.**—Good anchorage, clay and sand, is found north of Gull Island. The harbor between Thunder Bay and Sugar islands, 13 feet of water, good holding ground, gives protection from all winds. SW. of Thunder Bay Island and south of Sugar Island the anchorage is not good, the bottom being rocky.

**Thunder Bay.**—Between North and South points the bay is 8½ (10) miles wide, and from this line in to the mouth of Thunder Bay River, is nearly the same distance. The north shore is safe to approach to ½ mile, excepting south of North Point where the shoals extend one (1¼) mile SSE., the extreme south end being marked by a

**Buoy.**—A second-class can buoy, painted red, is moored in 18 feet of water one (1¼) mile S. by E. ½ E. (S. 18° 16' E.) from North Point. It marks the extreme end of the shoal extending southeasterly from North Point. Vessels must pass to the southward of this buoy.

On the western and southern shores of the bay, shoals and flats extend some distance from the various points and islands, but offer no obstacle to safe navigation if vessels keep within 2½ (2¾) miles of the northern shore.

**Grass Island**,  $\frac{3}{4}$  mile off shore, lies on a rocky flat at the head of the bay, nearly 2 miles northward of Partridge Point. Three-fourths mile and one ( $1\frac{1}{4}$ ) mile respectively SE. of Grass Island are shoal patches of 13 and 10 feet, but they offer no obstacle to navigation if the northern shore of the bay be kept aboard.

**Partridge Point** extends from the shore one ( $1\frac{1}{4}$ ) mile and is  $\frac{1}{2}$  mile broad. South of the point is a bight  $1\frac{1}{4}$  ( $1\frac{1}{2}$ ) miles long and wide, but filled with a flat which extends out to and surrounds Sulphur Island. The flat continues northward from Sulphur Island  $\frac{3}{4}$  mile and then curves to the NW., almost joining the spit extending  $\frac{1}{2}$  mile from Partridge Point. On this flat is a 5-foot spot,  $\frac{3}{4}$  mile N. by E. from the north point of Sulphur Island. East of this point one ( $1\frac{1}{4}$ ) mile is a small 13-foot shoal which is the NW. point of a narrow detached shoal extending  $\frac{3}{4}$  mile, with 14 feet on the southeastern end.

South of this spot  $\frac{1}{2}$  mile is a small 17-foot patch.

Between the shoal and Sulphur Island is a detached 14-foot patch.

The whole south shore of Thunder Bay is filled with a rocky flat extending northward from South Point toward Bird and Scare Crow islands nearly 3 miles; the edge of the flat  $\frac{1}{2}$  mile north of Scare Crow Island trends W. by N. to the western shore of the bay, passing  $1\frac{1}{2}$  ( $1\frac{3}{4}$ ) miles outside of Hard Wood Point and one ( $1\frac{1}{2}$ ) mile outside of Devil River. From South Point a rocky spit extends northeastward a mile, and another rocky spit eastward the same distance.

**Alpena.**—Thunder Bay River empties into the head of Thunder Bay, and at the mouth of the river is Alpena. This town is in the collection district of Huron and the nearest port of entry is Port Huron, Michigan.

**Improvements.**—The general project calls for a channel 16 feet deep between the 16-foot curve and a point in the river a mile above its mouth; the width varying from 200 feet at the outer end to 50 feet above. Bed rock was found  $\frac{3}{4}$  mile above the mouth of the river and the improvements were not carried farther than this point. The channel has shoaled at one place to 14 feet.

**Alpena Light.**—A fixed red light visible  $11\frac{1}{4}$  (13) miles in clear weather is shown 53 feet above the lake level, from a square, brown, pyramidal, open framework tower, the upper part inclosed.

The light tower is on the north side of the entrance to Thunder Bay River, on a crib 57 feet east of, and in a line with, Gilchrist Wharf.

**Fog Signal.**—A bell struck by machinery every 10 seconds.

**Signal Station.**—There is a signal station two blocks NW. of the lighthouse.

**Display Station.**—The United States Weather Bureau has a regular Display Station at Alpena.

**Directions for Entering.—From the Northward.**—Round Thunder Bay Island SE. point at a distance of  $\frac{1}{2}$  mile, then SW. by W.  $\frac{3}{8}$  W. (S.  $63^{\circ} 16' W.$ )  $3\frac{1}{2}$  ( $3\frac{3}{4}$ ) miles, until the buoy off North Point bears north, distant  $\frac{1}{2}$  mile, or the extreme eastern part of North Point, N. by W.  $\frac{1}{2}$  W. (N.  $16^{\circ} 52' W.$ ) distant  $1\frac{1}{2}$  ( $1\frac{1}{2}$ ) miles, thence NW. by W.  $\frac{7}{8}$  W. (N.  $66^{\circ} 05' W.$ )  $7\frac{1}{2}$  ( $8\frac{1}{4}$ ) miles will bring a vessel  $\frac{1}{2}$  mile off Thunder Bay River light.

**From the Southward.**—When east of South Point  $4\frac{1}{2}$  (5) miles, a NW.  $\frac{1}{2}$  N. (N.  $39^{\circ} 22' W.$ ) course  $13\frac{1}{4}$  ( $15\frac{1}{4}$ ) miles will bring a vessel  $\frac{1}{2}$  mile off Thunder Bay River light.

**Alpena to Presque Ile, Detour Passage and Georgian Bay.**—Bring Thunder Bay River light astern bearing NW. by W.  $\frac{1}{8}$  W. (N.  $66^{\circ} 05' W.$ ) and steer SE. by E.  $\frac{1}{8}$  E. (S.  $66^{\circ} 05' E.$ )  $7\frac{1}{2}$  ( $8\frac{1}{4}$ ) miles, until the buoy off North Point bears north, distant  $\frac{1}{2}$  mile; change course to NE. by E.  $\frac{3}{8}$  E. (N.  $63^{\circ} 16' E.$ ) for 6 (7) miles, passing  $\frac{1}{2}$  mile off the SE. point of Thunder Bay Island; change course to NNW.  $\frac{3}{4}$  W. (N.  $30^{\circ} 56' W.$ ) for  $23\frac{1}{2}$  ( $27\frac{1}{2}$ ) miles, which will bring a vessel abeam of Presque Ile lighthouse, distant 4 ( $4\frac{1}{2}$ ) miles. (Run in on range if desirous of making this harbor.) The same course continued for 38 ( $43\frac{1}{4}$ ) miles will bring a vessel in range with Point Detour lighthouse and buoy,  $\frac{1}{2}$  mile from the buoy.

If wishing to make Georgian Bay: when  $\frac{1}{2}$  mile SE. of the SE. point of Thunder Bay Island, change course to ENE.  $\frac{1}{2}$  E. (N.  $73^{\circ} 7' E.$ ) for  $63\frac{1}{2}$  (73) miles. This will bring a vessel  $\frac{1}{2}$  mile north of Gig Point, Cove Island.

**Alpena to Saginaw River, Sand Beach, and St. Clair River.**—Bring Thunder Bay River light astern, bearing NW.  $\frac{1}{2}$  N. (N.  $39^{\circ} 22' W.$ ) and steer SE.  $\frac{1}{2}$  S. (S.  $39^{\circ} 22' W.$ ) for  $13\frac{1}{4}$  ( $15\frac{1}{4}$ ) miles. This will bring a vessel with South Point bearing west  $4\frac{1}{2}$  (5) miles.

**Bound to Saginaw River,** change course to south for 23 ( $26\frac{1}{2}$ ) miles; this will bring a vessel east of Au Sable light  $4\frac{3}{4}$  ( $5\frac{1}{2}$ ) miles; change course to SSW.  $\frac{1}{8}$  W. (S.  $32^{\circ} 20' W.$ ) for 51 ( $58\frac{3}{4}$ ) miles, passing between the buoys NW. of Charity Island and the buoy SE. of Gravelly Point. This will bring a vessel off Saginaw River. For entering see special directions.

**Bound to Sand Beach and St. Clair River.**—When east of South Point  $4\frac{1}{2}$  (5) miles, shape a course SSE.  $\frac{1}{8}$  E. (S.  $23^{\circ} 54' E.$ ) for 69 ( $79\frac{1}{2}$ ) miles, which should bring a vessel east of Sand Beach Harbor 4 ( $4\frac{1}{2}$ ) miles. (If desirous of entering this harbor run in for the main entrance to the harbor.) When east of Sand Beach Harbor change course to S.  $\frac{3}{4}$  E. (S.  $8^{\circ} 26' E.$ ) for  $50\frac{3}{4}$  ( $58\frac{1}{2}$ ) miles, which will bring a vessel 2 ( $2\frac{1}{2}$ ) miles, NE. by E.  $\frac{1}{4}$  E. (N.  $59^{\circ} 03' E.$ ) from Fort Gratiot lighthouse and close to the Canadian shore.

For entering the river see special directions.

**Coast.**—Between South Point and Black River  $4\frac{1}{2}$  (5) miles to the southward the shore should not be approached within  $1\frac{1}{2}$  (2) miles.

Black River Island, a mile NE. of Black River, is surrounded with shoals which extend  $\frac{3}{4}$  mile ENE. from the island connecting it with the shore. Rocky spots extend one ( $1\frac{1}{2}$ ) mile eastward from Black River.

**Display Station.**—The United States Weather Bureau has a special Display Station at Black River.

The shore continues rocky to Alcona,  $3\frac{1}{2}$  (4) miles to the southward. Here the coastline bends to the westward, forming a shallow bight between Alcona and Sturgeon Point,  $3\frac{1}{2}$  (4) miles SSE. of Alcona.

A spit extends nearly a mile ENE. from Sturgeon Point and on the point is a

**Light.**—A fixed white light, visible 14 (16) miles in clear weather is exhibited 69 feet above the lake level, from a conical white tower connected by a covered way with a dwelling.

The lighthouse is on the easternmost point between Thunder and Saginaw bays.

**Life-Saving Station.**—The station is 75 yards south of the lighthouse.

**Coast.**—At Sturgeon Point the coast changes its direction to a little west of south and continues its rocky character. Harrisville is  $3\frac{1}{2}$  (4) miles from Sturgeon Point and Spring Mills  $1\frac{1}{2}$  (2) miles beyond. Between these places a rocky shoal extends off shore for a mile. Greenbush is  $3\frac{1}{2}$  (4) miles south of Spring Mills and from here to Au Sable light, a distance of 10 ( $12\frac{1}{2}$ ) miles, the shore continues its rocky character. Six (7) miles northward of Au Sable River there is a 9-foot spot a mile off shore.

**Au Sable,** at the mouth of the Au Sable River, is in the collection district of Huron, and Port Huron, Michigan, is the nearest port of entry.

**Improvements.**—June 30, 1890, the river had been so far improved that there was a 10-foot channel from the mouth of the river to Au Sable swing bridge, with a width of 120 feet across the bar. The improvement is but temporary. The shipments from the port are principally made from private piers built into the lake, entirely outside of the harbor.

**Light.**—A fixed red light, visible  $8\frac{1}{2}$  ( $9\frac{1}{2}$ ) miles in clear weather, is exhibited 32 feet above the lake level, from a square, brown, pyramidal, open framework tower, upper part inclosed. There is an elevated walk from the lighthouse to the shore.

The tower is on the outer end of the north pier, at the mouth of the river.

**Coast.**—The shore continues its southerly direction, from Au Sable,  $4\frac{1}{2}$  (5) miles to Point au Sable. Shoals surround this point to a distance of  $\frac{3}{4}$  mile and it is best to keep at least  $1\frac{1}{2}$  ( $1\frac{1}{2}$ ) miles off shore. At Point au Sable the coast bends more to the westward to Tawas (Ottawa) Point,  $6\frac{1}{2}$

(7½) miles SW. of Point au Sable. Tawas Point has a sand spit extending from it for nearly a mile southwesterly and westerly. The SW. and NW. ends of this spit are marked by

**Buoys.**—A second-class nun buoy, painted red, is moored in 33 feet of water 1½ statute miles SW. ¾ W. (S. 53° 26' W.) of Tawas (Ottawa) Point. It is placed on the extreme SW. point of the shoal. Vessels must not pass inside of this buoy.

A 25-foot spar buoy, painted red, is moored in 16 feet of water 1½ statute miles N. by E. (N. 11° 15' E.) of Tawas Point buoy and marks the NW. point of the shoal.

**Light.**—An intermittent white light with red sector. The light is fixed for 25 seconds, followed by an eclipse of 5 seconds. The light shows red over the flat for 90°, from bearing NE. to bearing SE., and white the remaining 270°. The light is visible in clear weather 14 (16) miles and is exhibited 70½ feet above the lake level, from a conical, white tower, connected with a red dwelling by a covered way. The lighthouse is near the SW. end of Tawas Point.

**Life-Saving Station** is 1,100 yards NE. by E. from the lighthouse.

**Tawas Bay** is protected by Tawas Point, a narrow peninsula projecting over a mile southwesterly from the mainland. It is 3½ (4) miles wide between Tawas Point and the shore west of the point, and 1½ (2) miles long northwesterly from this line.

The available anchorage grounds are contracted to a space a little over a mile in width by the flats extending from the point and the western shore of the bay. There are no dangers outside the flats and the bottom is sand and clay. The bay offers secure anchorage in all winds excepting those from the south.

**Tawas and East Tawas** are on the western shore of the bay.

**Display Station.**—There is a special Display Station of the United States Weather Bureau at East Tawas.

**Directions.**—From the Northward or Westward steer to the SW. or west until Tawas lighthouse bears north 1½ (1½) miles, when change course to NW. by W. ¼ W. (N. 57° 39' W.) for the mill at Tawas. Run in on this course passing southward of Tawas Point buoy, until Tawas lighthouse bears E. ½ N. (N. 84° 22' E.) when change course to NE. ¼ E. (N. 52° 01' E.) and run into the harbor and anchor in 3½ fathoms of water.

**From the Southward.**—Steer north, and bring the lighthouse on Tawas Point to bear E. ½ N. (N. 84° 22' E.) 1½ (2) miles, when proceed as above.

**Coast.**—From Tawas Bay to Gravelly Point the coast trends southerly for 13 (15) miles; the shore should not be approached within one (1½) mile as rocky flats extend off in places for nearly that distance, especially off Mason Creek and Alabaster where the shoals are rather more offlying.

There are only 5 feet of water  $\frac{3}{4}$  mile SE. of Whitestone Point and a detached 16-foot shoal  $1\frac{1}{4}$  ( $1\frac{1}{2}$ ) miles south of it and a little over a mile off shore.

**Gravelly Point**, the inner western point of entrance to Saginaw Bay projects some distance from the mainland southeasterly. It continues in the same direction for  $2\frac{1}{4}$  ( $2\frac{1}{2}$ ) miles as a sand spit. There are 11 feet of water  $1\frac{1}{2}$  ( $1\frac{3}{4}$ ) miles SE. of the point and 16 feet at the SE. extreme of the spit. South of the end of the spit a short distance is a 17-foot detached patch. The spit is marked by a

**Buoy.**—A first-class nun buoy, painted red, is moored in 20 feet of water  $2\frac{1}{4}$  ( $2\frac{1}{2}$ ) miles SE. by E. (S.  $56^{\circ}$  15' E.) of Gravelly Point and marks the extreme point of the shoal.

Vessels must not attempt to pass between this buoy and the shore.

**Saginaw Bay.**—Between the outer points of the entrance, Point au Sable and Pointe aux Barques, the bay is 22 ( $25\frac{1}{2}$ ) miles wide. It is contracted to 14 (16) miles between Gravelly and Oak points, but the entrance channel proper, between Gravelly Point and Charity Island, is only  $2\frac{1}{2}$  ( $2\frac{3}{4}$ ) miles wide between the shoals.

**West Shore.**—The head of the bight within Gravelly Point is filled with shoals; the 3-fathom curve is nearly a mile eastward of Point aux Gres, and just within it, east of the point is a 7-foot patch; from this patch the 3-fathom curve trends SW. by S. to the head of the bay. Outside the curve there are no dangers.

The Aux Gres, Rifle, Pine, Saginaw, and Pinconning rivers empty into Saginaw Bay on its western shore.

**East Shore.**—The whole southern and eastern side of Saginaw bay, to Sand Point, is filled by a flat which extends from the eastern shore 7 (8) miles. The flat extends northward from Sand Point to Little Charity and Charity islands. It surrounds these islands and extends in all directions from the Charity islands for  $1\frac{1}{4}$  (2) miles.

This flat has on it many rocky shoals and closes the eastern entrance to the bay. Vessels should not attempt to enter the bay southward of the islands. On the eastern shore are Sabewaing and Pigeon rivers, and the towns of Sabewaing, Bayport, Caseville, Port Crescent, and Port Austin.

The northwestern edge of the flat is marked by a

**Buoy.**—A second-class can buoy, painted black, is moored in 17 feet of water,  $2\frac{1}{4}$  ( $2\frac{1}{2}$ ) miles NW. by W.  $\frac{1}{4}$  W. (N.  $59^{\circ}$  3' W.) of Charity Island lighthouse. It marks the NW. end of the shoal extending from Charity Island.

**Charity Island Light.**—A fixed white light, visible  $12\frac{1}{4}$  (14) miles in clear weather is exhibited 45 feet above the lake level, from a conical, white tower, connected with a dwelling by a covered way.

The lighthouse is on the NW. point of Charity Island.



**Approaching Saginaw Bay from the Southward.**—Vessels must pass at least a mile to the northward of Port Austin light, then steer W.  $\frac{1}{2}$  S. (S.  $84^{\circ} 22' W.$ )  $22\frac{1}{2}$  ( $25\frac{1}{2}$ ) miles, which will lead to the northward of Charity Island buoy, being careful on approaching it to keep it well open on the port bow to avoid the shoal extending  $1\frac{1}{2}$  ( $1\frac{3}{4}$ ) miles northward from Charity Island lighthouse. Vessels should not pass southward of the island. After passing the buoy steer SW. by S. (S.  $33^{\circ} 45' W.$ ) for Saginaw River, leaving Gravelly Point buoy on the starboard hand.

**Shoal.**—A shoal with 16 and 17 feet of water over it, and extending east and west nearly a mile, lies 4 ( $4\frac{1}{2}$ ) miles NNE. of the entrance to Saginaw River, and nearly a mile outside the 3-fathom curve.

**Saginaw River** with its tributaries drains a territory of some 5,800 square miles. The river proper has a length of 19 (22) miles at which distance from the mouth the Tittabawassee and Shiawassee unite to form the main stream. The cities of East and West Saginaw are built on the upper end of the river, and Bay City near the mouth. The river has a large volume and at times a strong current.

**Improvements.**—Prior to improvements the entrance was obstructed by an extended bar in Saginaw Bay a mile from shore and  $\frac{1}{2}$  mile across between the 10-foot contours, with a minimum depth of 9 feet.

January 1, 1894, the channel across the outer bar had been dredged to a depth of 14 feet, and a width of 200 feet, from the mouth of the river to the 14-foot curve. It is not safe for vessels drawing over 13 feet to cross the bar. It is proposed to further increase this depth to 16 feet. The cut is marked by

**Buoys.**—The entrance to the channel is marked by two buoys, a black 16-foot spar buoy, No. 1, in 13 feet, on the east side, and a red nun buoy, No. 2, in 13 feet, on the west side. S.  $\frac{1}{2}$  W. 550 yards is a black spar buoy, No. 3, in 11 feet of water on the east bank, and opposite on the west bank, in 11 feet of water, is a red spar buoy, No. 4. Beyond these at intervals of 550 yards, the spar buoys are in pairs, black on the east bank and red on the west bank, all in 11 feet of water, the black buoys bearing odd numbers, the red buoys even numbers. Buoys 9 and 10 mark the commencement of deep water inside the bar. Buoys 13 and 14 mark the mouth of the river and are the last on the course S.  $\frac{1}{2}$  W. (S.  $5^{\circ} 37' W.$ ) A short distance beyond this pair the course is changed to S. by E.  $\frac{1}{4}$  E. (S.  $14^{\circ} 03' E.$ )

**Range Lights.**—Two fixed red lights visible in clear weather (front)  $7\frac{1}{2}$  ( $8\frac{1}{2}$ ) and (rear)  $11\frac{1}{2}$  (13) miles. The front light is shown 37 feet above the lake level and the rear light 61 feet.

The front light tower is at the west entrance point to the Saginaw River. It is a square, red, pyramidal, open framework tower, upper part inclosed, on a crib.

The rear light is 2,330 feet S.  $\frac{1}{2}$  W. (S.  $5^{\circ} 37'$  W.) from the front light, and is shown from a square, yellow tower attached to a dwelling.

**Display Station.**—The United States Weather Bureau has a special Display Station at Bay City.

**Directions for Entering.**—Bring the lights in range, S.  $\frac{1}{2}$  W. (S.  $5^{\circ} 37'$  W.) when  $2\frac{1}{4}$  ( $2\frac{1}{2}$ ) miles from the front light, and steer in on the range, passing between the spar and nun buoys at the entrance to the cut. These buoys are about 2 miles from the front light. Keep on the range following the buoys to  $\frac{1}{2}$  mile from the front light until Nos. 13 and 14 are about one point abaft the beam, when change course to S. by E.  $\frac{1}{4}$  E. (S.  $14^{\circ} 03'$  E.) and keep in mid-channel until off the Bay City dry dock, when haul to the south shore to avoid the shoals in mid-channel, opposite the slips at McEwan's mill, after which there is no obstruction until the Belinda street bridge is reached.

**Saginaw River to Sand Beach and St. Clair River.**—When clear of the entrance buoys steer NE. by N. (N.  $33^{\circ} 45'$  E.)  $27\frac{1}{2}$  (32) miles, when Charity Island light will be abeam to starboard distant nearly 3 miles; change course to E.  $\frac{1}{2}$  N. (N.  $84^{\circ} 22'$  E.) for  $22\frac{1}{4}$  ( $25\frac{1}{2}$ ) miles, when Port Austin light should be abeam, distant about a mile; round this part of the coast, keeping it at a distance of  $2\frac{1}{4}$  ( $2\frac{1}{2}$ ) miles until the bell buoy off Pointe aux Barques lighthouse is passed, when it can be approached nearer.

Run in for Sand Beach when off it, if desired.

When east of Sand Beach Harbor  $2\frac{1}{2}$  miles a S.  $\frac{1}{8}$  E. (S.  $9^{\circ} 50'$  E.) course for  $51$  ( $58\frac{1}{2}$ ) miles will bring a vessel 2 ( $2\frac{1}{4}$ ) miles NE. by E.  $\frac{1}{4}$  E. (N.  $59^{\circ} 03'$  E.) from Fort Gratiot light and close to the Canadian shore. See special directions, for entering the river.

**From Saginaw River to Detour Passage and Main Entrance to Georgian Bay.**—From Charity Island light abeam to starboard, distant  $2\frac{1}{2}$  (3) miles, a NNE.  $\frac{1}{8}$  E. (N.  $32^{\circ} 20'$  E.) course for  $24\frac{1}{4}$  (28) miles will bring a vessel east of Au Sable light  $4\frac{1}{2}$  ( $5\frac{1}{2}$ ) miles; change course to N.  $\frac{1}{2}$  E. (N.  $5^{\circ} 37'$  E.) for  $38\frac{1}{4}$  (44) miles; a vessel should then be abeam of Thunder Bay Island light, distant  $2\frac{1}{2}$  (3) miles. Continue this course for  $1\frac{1}{4}$  (2) miles, thence a NNE.  $\frac{3}{4}$  E. (N.  $30^{\circ} 56'$  E.) course for  $62\frac{1}{4}$  ( $71\frac{1}{4}$ ) miles should bring a vessel  $\frac{1}{2}$  mile from Point Detour buoy, with the buoy in range with the light. This last course passes within 4 ( $4\frac{1}{2}$ ) miles of Presque Ile lighthouse, and well outside of a 4-fathom rocky spot  $5\frac{1}{4}$  (6) miles north of Thunder Bay Island light.

**To Make Georgian Bay.**—From off Charity Island buoy a NE.  $\frac{1}{8}$  E. (N.  $46^{\circ} 24'$  E.) course for  $105\frac{1}{2}$  ( $121\frac{1}{2}$ ) miles will bring a vessel  $2\frac{1}{2}$  (3) miles west of Cove Island light. See special direction in supplement for Georgian Bay.

**Coast.**—Between Oak Point and Pointe aux Barques, 14 (16) miles to the ENE. the coast has several indentations, but is generally bordered by

a rocky flat which extends off shore, in places  $1\frac{1}{4}$  (2) miles. Off Port Crescent, at the mouth of the Partridge River, the reef is broken and a vessel with local knowledge can approach the shore close-to, but off shore  $1\frac{1}{2}$  ( $1\frac{3}{4}$ ) miles is a narrow detached shoal, least water 5 feet, running north and south for over a mile. Midway between Flat Rock Point and Pointe aux Barques is Port Austin, an open roadstead, with several piers.

Pointe aux Barques is surrounded by reefs which extend NW.  $1\frac{1}{2}$  ( $1\frac{1}{2}$ ) miles. Near the NW. end is

**Port Austin Reef Light.**—A fixed white and flashing red light, fixed white for one minute, followed by five consecutive red flashes at intervals of 12 seconds during the next minute, visible  $14\frac{1}{2}$  ( $16\frac{1}{2}$ ) miles, is exhibited 80 feet above the lake level, from a square, white, pyramidal, open framework tower, upper part inclosed, with brown fog-signal building on a high crib.

The lighthouse is on Port Austin Reef,  $1\frac{1}{4}$  ( $1\frac{1}{2}$ ) miles from the mainland. There is no passage between the light and the mainland, and vessels should give the light a berth of  $\frac{1}{2}$  mile. The light is known as Port Austin light.

**Fog Signal.**—A 10-inch steam whistle gives a blast of 7 seconds, followed by a silent interval of 80 seconds.

**Display Station.**—The United States Weather Bureau has a special Display Station at Pointe aux Barques.

**Coast.**—Between Pointe aux Barques and Burnt Cabin Point the reef is somewhat broken, but it extends off the latter point a mile. It follows the coast, extending out from a mile to  $1\frac{1}{2}$  miles and at Pointe aux Barques lighthouse the edge of the reef is  $1\frac{3}{4}$  (2) miles off shore. Just south of Burnt Cabin Point is a life-saving station and a little beyond is Grindstone City. New River is 2 miles farther SE. and Huron City at the mouth of Willow River is one ( $1\frac{1}{4}$ ) mile beyond it. Orion Rock, with 6 feet of water over it lies one ( $1\frac{1}{4}$ ) mile NW. of Willow River Wharf. Two miles SE. of Huron City is

**Pointe aux Barques Light.**—A flashing white light every 10 seconds, visible in clear weather  $15\frac{1}{4}$  ( $17\frac{1}{2}$ ) miles, is exhibited 89 feet above the lake level from a conical tower connected by a covered way with a dwelling, both white.

**Life-Saving Station** is 300 yards south of the lighthouse.

**Buoy.**—A first-class bell buoy, painted black, is moored in 33 feet of water 2 ( $2\frac{1}{4}$ ) miles W.  $\frac{1}{8}$  N. (N.  $88^{\circ}$  35' W.) of Pointe aux Barques lighthouse. It marks the reef extending off shore. Vessels must pass outside of this bell buoy.

**Coast.**—NNE. one ( $1\frac{1}{4}$ ) mile from Pointe aux Barques lighthouse is an 8-foot shoal, with deeper water between it and the shore. Between Pointe aux Barques and Sand Beach, 14 miles SSE., the reef continues and in

places extends out for a mile, generally  $\frac{3}{4}$  mile. Port Hope is halfway to Sand Beach. Halfway between Port Hope and Sand Beach is Forest Bay, off which are several dangerous ledges running north and south, a mile from shore.

**Sand Beach**, a harbor of refuge, is just north of Cranes Point. This is the only place of shelter in the vicinity of Pointe aux Barques, an exposed and stormy locality, with no other harbor or safe anchorage for  $69\frac{1}{2}$  (80) miles along a rocky and dangerous coast. The entire Lake Huron traffic passes within sight of this harbor. This includes all through traffic to and from lakes Superior and Michigan.

**Improvements.**—As constructed, the harbor works are built in three sections, each consisting of heavy timber cribs, filled with stone. The west pier incloses the harbor on the north shore and, starting in shallow water 750 feet from shore, extends ESE. 1,503 feet with a width increasing from 19 to 26 feet.

The main pier extends NW. and SE. 4,675 feet, with a uniform width of 38 feet. The south pier extends north and south 1,956 feet, with a width varying from 26 to 18 feet, and protects the harbor from the eastward.

The north entrance is 300 feet wide, but is not safe for vessels drawing over 15 feet. The main entrance is 600 feet wide and has a depth (1894) of 21 feet. It is proposed to dredge the north entrance to the same depth.

**Directions.—Anchorage.**—The main entrance is the one commonly used by all vessels. The southern margin of it is bordered by a rocky bottom of insufficient depth. There is very limited holding ground inside the harbor, most of the bottom being rocky. Steamers go directly to the main pier and make fast; sailing vessels either make fast to the pier or anchor on the west side, south of the west pier, where there is limited holding ground.

**Life-Saving Station.**—There is a railroad pier in the harbor, at the inner end of which is a life-saving station.

**Display Station.**—The United States Weather Bureau has a special Display Station at Sand Beach.

#### SAND BEACH LIGHTS.

**North Entrance.—East Light**, a fixed white light, visible  $12\frac{3}{4}$  ( $13\frac{1}{2}$ ) miles in clear weather, is exhibited 42 feet above the lake level, from a white, pyramidal, open framework tower, upper part inclosed, on the end of the breakwater, east side of the north entrance to the harbor.

**West Light.**—A fixed red light, visible about  $9\frac{1}{2}$  (11) miles in clear weather, is shown  $27\frac{1}{2}$  feet above the lake level from a skeleton tripod on the end of the breakwater, west side of the north entrance to the harbor.

These lights mark the northern entrance to the Harbor of Refuge.

**Main (East) Entrance.—North (Main) Light.**—A flashing light, alternately red and white every 5 seconds, visible  $13\frac{1}{4}$  ( $14\frac{3}{4}$ ) miles in clear weather, is exhibited  $54\frac{1}{2}$  feet above the lake level from a conical, brown tower, surmounted by a black lantern.

The lighthouse, with brown fog-signal house, is on a rectangular crib just inside the north side of east entrance to the harbor.

**Fog Signal.**—A 10-inch steam whistle gives a blast of 5 seconds duration, followed by a silent interval of 25 seconds.

**South Light.**—A fixed red light, visible  $9\frac{1}{2}$  (11) miles in clear weather, is exhibited  $27\frac{1}{2}$  feet above the lake level from a skeleton tripod on the end of the breakwater, south side of the east entrance to the harbor.

These lights mark the eastern or main entrance to the Harbor of Refuge.

**Coast.**—From Cranes Point to the St. Clair River the coast trends S. by E. nearly  $43\frac{1}{2}$  (50) miles, and is fronted by rocky shoals the whole distance, but can be safely approached anywhere to a mile.

Barnetsville is a mile southward of Cranes Point, and Elm Creek  $4\frac{1}{2}$  ( $5\frac{1}{2}$ ) miles farther on.

At Elm Creek a dangerous spit extends from the shore NE.  $\frac{3}{4}$  mile.

White Rock Town is  $1\frac{1}{4}$  (2) miles south from Elm Creek. North  $\frac{3}{4}$  mile from the end of the wharf at White Rock Point is a rock out of water, known as White Rock. A ledge with 4 or 5 feet of water over it extends SE. 300 yards from the rock. Forestville is halfway between White Rock Point and Indian Creek,  $7\frac{1}{4}$  (9) miles to the southward. Rocky spots are found along this stretch of the coast  $\frac{1}{2}$  mile off shore. Richmondville is a short distance southward of Indian Creek. From here to Port Sanilac,  $8\frac{3}{4}$  (10) miles farther south, the coast continues its rocky character, but can be approached somewhat nearer than that farther north. Picnic Point,  $2\frac{1}{4}$  ( $3\frac{1}{2}$ ) miles north of Port Sanilac, is the south point of Fools Bay, a slight, shallow indentation in the coast, with Forester at its northern end.

At Port Sanilac is a

**Light.**—A fixed red light, visible  $11\frac{1}{4}$  (13) miles, is exhibited 69 feet above the lake level, from an octagonal, pyramidal white tower, connected by a covered way with a red dwelling.

From Port Sanilac to Lexington, 10 ( $11\frac{1}{2}$ ) miles to the southward, the coast continues in the same direction and of the same general character. At Burchville, 7 miles beyond Lexington, there is a detached rocky spot of 17 feet,  $\frac{3}{4}$  mile NE. of the town and nearly the same distance off shore. At Lakeport, 3 ( $3\frac{1}{2}$ ) miles south of Burchville, the coast changes its direction slightly to the eastward and trends SSE. for  $7\frac{1}{4}$  (9) miles to the west entrance point of the St. Clair River.

North of this point,  $1\frac{1}{2}$  ( $1\frac{3}{4}$ ) miles and  $1\frac{1}{4}$  (2) miles, are 16 and 17 foot shoals  $\frac{3}{4}$  mile off shore.

**Shoals.**—Corsica Shoal with 16 feet least water over it, Harlem Shoal with 17 feet, and Northwest Shoal with 16 feet lie off the entrance to St. Clair River.

**Lake Huron Lightvessel.**—A fixed white light, visible  $11\frac{1}{4}$  ( $13\frac{1}{2}$ ) miles, is shown 40 feet above the lake level from the fore masthead.

The vessel has two masts, is schooner rigged, and has no bowsprit. There is a circular black cage-work day mark at the fore masthead and a small black smokestack and fog signal between the masts. The hull is straw color, with "Lake Huron" in large black letters on each side and "No. 61" on each bow.

The vessel is moored  $1\frac{1}{10}$  ( $1\frac{1}{5}$ ) miles N. by E.  $\frac{1}{4}$  E. (N.  $19^{\circ} 41'$  E.) from Fort Gratiot lighthouse, in 20 feet of water.

**Fog Signal.**—A 6-inch steam whistle gives a blast of 2 seconds duration, followed by a silent interval of 10 seconds. If the whistle is disabled, a bell will be rung by hand.

**Fort Gratiot Light.\***—A fixed and flashing white light, flash every one minute, is exhibited 82 feet above the lake level from a conical white tower, with a red dwelling detached, on the western entrance point to St. Clair River. The light is visible  $14\frac{1}{4}$  (17) miles in clear weather.

**Fog Signal.**—An 8-inch steam whistle sounds a blast of 8 seconds duration, followed by a silent interval of 52 seconds. The fog-signal building is in front of the light station.

A description of and directions for St. Clair River is given in the following chapter.

**St. Clair River to Lake Michigan and Detour Passage.**—After leaving the river, on the Fort Gratiot range, bring the lighthouse to bear SW.  $\frac{1}{4}$  S. (S.  $42^{\circ} 11'$  W.) and steer ENE.  $\frac{1}{4}$  E. (N.  $70^{\circ} 18'$  E.) 1 ( $1\frac{1}{4}$ ) miles; this leads out in the best water and south of all shoals off the entrance to the river. When 2 ( $2\frac{1}{4}$ ) miles from the light change course to N.  $\frac{1}{4}$  W. (N.  $8^{\circ} 26'$  W.) for  $50\frac{1}{4}$  ( $58\frac{1}{2}$ ) miles; this will bring a vessel east of Sand Beach  $3\frac{1}{4}$  ( $4\frac{1}{4}$ ) miles; here change course to NW.  $\frac{1}{8}$  W. (N.  $18^{\circ} 16'$  W.) for 78 ( $89\frac{1}{4}$ ) miles, when Thunder Bay Island light will be abeam, distant  $3\frac{1}{4}$  ( $3\frac{3}{4}$ ) miles; change course to NNW.  $\frac{1}{4}$  W. (N.  $30^{\circ} 56'$  W.) for  $62\frac{1}{4}$  ( $71\frac{1}{4}$ ) miles. This will bring a vessel  $\frac{1}{8}$  mile off Point Detour buoy with the buoy and light in range.

This course passes within 4 ( $4\frac{1}{2}$ ) miles of Presque Ile lighthouse and, if desirous of going into Lake Michigan, change course to the westward when this light is abeam and follow the coast around to the Straits of Mackinac, keeping 4 or 5 miles off shore.

**St. Clair River to Georgian Bay.**—When 2 ( $2\frac{1}{4}$ ) miles NE. by E.  $\frac{1}{4}$  E. (N.  $59^{\circ} 03'$  E.) from Fort Gratiot lighthouse set course N.  $\frac{1}{8}$  E. (N.  $9^{\circ} 50'$  E.) for 142 ( $163\frac{1}{2}$ ) miles. This will bring a vessel west of Cove

\* An extensive 15-foot shoal, with 22 feet around it, lies  $2\frac{3}{4}$  ( $2\frac{3}{4}$ ) miles N. by E. (N.  $11^{\circ} 15'$  E.) from this light.

Island light, distant  $2\frac{1}{2}$  (3) miles. See directions in supplement, for Georgian Bay.

## CANADIAN SHORE.

**Detour Passage and Port Collier** are described in Chapter III of Lake Superior. Drummond Island belongs to the United States; Cockburn and Grand Manitoulin islands to Canada. These islands form the eastern part of the northern shore of Lake Huron. The southern shores of these islands have not been surveyed and no description can be given of them.

Vessels should give this whole coast a wide berth.

**False Detour Channel**, nearly  $17\frac{1}{2}$  (20) miles east of Detour Passage, is 6 (7) miles long N.E. by N. and S.W. by S., with an average width of  $1\frac{3}{4}$  (2) miles. Apparently there are no dangers if a mid-channel course be kept.

**Strait of Mississauga**, the next passage east, is a little longer and broader than False Detour Channel and takes a N. by E.  $\frac{1}{2}$  E. direction. This passage is also apparently clear in mid-channel.

At the western entrance to the strait off the southeastern side of Cockburn Island are the Magnetic Reefs. They extend  $2\frac{1}{4}$  ( $2\frac{1}{2}$ ) miles southeasterly from the south point of Cockburn Island and  $2\frac{1}{2}$  (3) miles into the strait.

The southeastern entrance point to the strait is marked by

**Mississauga Light**.—A fixed white light, visible 13 (15) miles in clear weather, is exhibited 46 feet above the lake level from a white, square tower on the S.W. point of Grand Manitoulin Island. It serves as a guide through the strait.

**Fog Signal**.—A steam wild-cat whistle gives a blast of 8 seconds duration, followed by a silent interval of 2 minutes. The pitch of the whistle varies during the blast.

**Shoals**.—At the eastern entrance to the strait, S. by E.  $\frac{3}{4}$  E. (S.  $19^{\circ} 41'$  E.), 3 ( $3\frac{1}{2}$ ) miles from the light, is a detached rock and shoal.

**Green Island**, a little farther eastward, is connected with Manitoulin Island by shoals.

**Duck Islands**, five in number, extend south from the coast of Manitoulin Island 12 ( $13\frac{3}{4}$ ) miles. The Inner Duck Island is surrounded by reefs, which extend northward almost to Manitoulin Island. Reefs extend off the north shore of the Western Duck. Middle Duck is surrounded by reefs. Reefs extend off the eastern edge of Outer Duck and  $1\frac{1}{2}$  ( $1\frac{3}{4}$ ) miles southerly from its southern point. Reefs line the north and eastern shore of Great Duck, and extend a mile to the southward from its S.E. end. There is a detached reef  $\frac{1}{2}$  mile off the north shore of Great Duck. The passage between the Duck islands and between the islands and the shore should not be attempted. The S.W. end of the Great Duck is marked by a

**Light.**—A revolving red and white light, one red and two white flashes every 2 minutes, greatest brilliancy every 40 seconds, and visible 15 (17½) miles in clear weather, is exhibited 64 feet above the lake level from a square, white tower, with dwelling attached.

The lighthouse is on the SW. point of Great Duck Island.

**Fog Signal.**—A steam horn gives a blast of 8 seconds, followed by a silent interval of 35 seconds.

The fog-signal building is 150 feet SE. of the lighthouse.

**Coast.**—From abreast of Inner Duck Island the south shore of Manitoulin Island extends ESE. 48 (55½) miles to Owen Channel. The coast is much indented in this stretch and there are several shoals a mile off shore. The coast has been but partially surveyed. Portage, Providence, Michael, and Thomas bays are in this stretch; the two former are apparently filled with shoals. Michael Point, the southern boundary of Michael Bay, extends over a mile into the lake and is continued westward 2 (2½) miles as a narrow reef. The bight between Michael and Walker points is blocked by reefs. On the western end of Michael Point is

**Michael Point Light.**—A fixed white light, visible 13 (15) miles in clear weather, is exhibited 40 feet above the lake level, from a square, white tower, on the south side of Grand Manitoulin Island.

**Fog Signal.**—A hand horn answers vessels' fog signals.

Between Hungerford Point, the south point of Manitoulin Island, and Cape Hurd 19½ (22½) miles to the southward, are Owen, Fitzwilliam, Yeo, Lucas, Main, MacGregor, Devil Island, and Cape Hurd channels, leading into Georgian Bay. These channels are formed by the various islands in the entrance to the bay and are described in chapter IV of the supplement.

**Isle of Coves Light.**—A flashing white light, flash 10 seconds, eclipsed 15 seconds, visible 15 (17½) miles in clear weather, is shown 90 feet above the lake level from a white, circular tower on Gig Point, the north point of Cove Island.

**Fog Signal.**—A steam horn gives a blast of 10 seconds, followed by a silent interval of 110 seconds.

The fog horn is westward of the lighthouse.

**Coast.**—**Cape Hurd**, the northwestern point of Saugeen Peninsula, extends to the NW. from the mainland of Canada. The cape is low, flat, and covered with small timber. From Cape Hurd the coast trends SE. by S. 20 (23) miles, to Greenough Point. It is much indented and is lined with reefs the whole distance. From a point 2 (2½) miles north of Greenough Point a reef extends 2 (2½) miles southerly, having deep water inside it.

**Stokes Bay**, east of Greenough Point, is almost blocked by reefs, and in its entrance is Lyal Island connected to the mainland, to the southward and eastward, by an extensive reef. North of Lyal Island is the only clear water in Stokes Bay. The NW. point of Lyal Island is marked by



**Lyal Light.**—A revolving white light, every 15 seconds, visible 12 ( $13\frac{1}{2}$ ) miles in clear weather, is exhibited 51 feet above the lake level, from a square, white lighthouse, with a dwelling attached.

The light is a coast light and a guide to Stokes Bay and to a small boat harbor close by.

**Coast.**—Between Lyal Island and Chiefs Point, 16 miles south, the coast is lined with offlying reefs and islands, the principal of which are the Ghegheto Islands. This part of the coast should be given a berth of at least  $4\frac{1}{2}$  (5) miles.

Between Chiefs Point and Chantry Island the coast is freer of reefs. Chantry Island is in the middle of an extensive reef which connects it with the shore and extends from it in all other directions for over  $\frac{1}{2}$  mile.

The island is  $\frac{1}{2}$  mile long, and  $1\frac{1}{4}$  (2) miles WSW. from the mouth of the Saugeen River. On the north point of the island is

**Chantry Island Light.**—A fixed white light, visible 15 ( $17\frac{1}{2}$ ) miles in clear weather, is exhibited 86 feet above the lake level, from a white, circular tower on the north point of Chantry Island.

**Fog Signal.**—A hand horn answers vessels' fog signals.

**Southampton** is at the mouth of the Saugeen River, east of Chantry Island.

**The Harbor** is formed by a breakwater 1,600 feet long extending easterly from the old breakwater at the northern end of the island and a breakwater 2,000 feet long curving from the mainland to within 400 feet of the end of the breakwater extending from Chantry Island. A landing pier has been built in the inner harbor, where a quantity of stone has been removed from a shoal adjoining the anchorage ground. The breakwaters are continuous cribs, filled with stone. The depth of the channel is reported to be only 14 feet.

**Saugeen Light.**—A fixed white light, visible 10 ( $11\frac{1}{2}$ ) miles in clear weather, is exhibited 30 feet above the lake level from a mast with a brown shed at the base, standing on a crib on the breakwater, on the north side of the mouth of the Saugeen River.

It serves to guide fishing boats into Saugeen River.

**Southampton Harbor Range Lights.**—**Front Light.**—Fixed red to the north, white in the harbor, visible 7 (8) miles in clear weather, is exhibited 29 feet above the lake level, from a square, white tower, on the east end of the west breakwater, NE.  $\frac{1}{4}$  E. (N.  $53^{\circ} 26' E.$ ) 933 yards from the light on Chantry Island.

**Rear Light.**—A fixed white light, visible 10 ( $11\frac{1}{2}$ ) miles in clear weather, is exhibited 34 feet above the lake level, from a white, square tower on the shore south of the landing pier, 2,100 yards S. by E. ( $S. 11^{\circ} 15' E.$ ) from the front light.

**Directions.**—This range leads to the opening in the breakwater, at the north end of the harbor. The rear light must be opened east of the front light to clear the shoal running out from the north end of Chantry Island.

**Port Elgin** is in the bight,  $3\frac{1}{2}$  (4) miles south of Chantry Island. The reef extends northward from the point west of Port Elgin  $1\frac{1}{2}$  ( $1\frac{3}{4}$ ) miles.

**Port Elgin Light.**—A fixed white light is exhibited from a pole on the corner of a shed on the outer end of the Government wharf.

**Coast.**—From west of Port Elgin the coast trends SW. 8 ( $9\frac{1}{4}$ ) miles to Point Douglas, and should not be approached closer than  $1\frac{1}{2}$  ( $1\frac{3}{4}$ ) miles on account of the reefs which line it. Two miles south of Point Douglas is Inverhuron at the mouth of a small stream. It has one pier 450 feet in length, with 14 feet at the outer end. From here the coast trends SSW. 7 (8) miles to Kincardine where there is a small stream.

**Kincardine Range Lights.**—**Front Light.**—A fixed red light, visible 8 ( $9\frac{1}{4}$ ) miles in clear weather, is shown 37 feet above the lake level, from a square, white tower, on the north pier, 1,185 feet WNW. (N.  $67^{\circ}$  30' W.) from the main light.

**Main (Rear) Light.**—An alternating red and white light every 20 seconds, visible 14 (16) miles in clear weather, is exhibited 76 feet above the lake level, from a fawn-colored octagonal tower, dwelling attached, on a high stone foundation on the hillside in the town of Kincardine.

The front light is visible in the direction of the range. The rear light is visible from all points seaward.

The range leads somewhat to the northward of the head of the north pier.

**Point Clark** is  $7\frac{1}{2}$  ( $8\frac{1}{4}$ ) miles SW. from Kincardine light, the coast between being bordered by a reef which extends a mile off shore in places. There is a reef extending from the point  $1\frac{1}{2}$  ( $1\frac{3}{4}$ ) miles westerly, and south 3 ( $3\frac{1}{2}$ ) miles of Point Clark is a similar reef. On Point Clark is

**Point Clark Light.**—A revolving white light, every 30 seconds, visible 15 ( $17\frac{1}{4}$ ) miles in clear weather, is exhibited 87 feet above the lake level, from a white, circular tower.

**Port Albert**, at the mouth of Nine Mile River is 8 ( $9\frac{1}{4}$ ) miles south of the last-mentioned reef, and Goderich, at the mouth of the Maitland River is 8 ( $9\frac{1}{4}$ ) miles south of Port Albert. All this portion of the coast can be approached with safety to  $\frac{1}{2}$  mile.

**Goderich**, a harbor of refuge, is an inclosed basin with a channel cut through the beach, connecting it with deep water in Lake Huron. The sides of the channel are protected by piers extending into the lake. There are two piers running parallel east and west for the distance of 1,509 feet. The north pier has an extension of 110 feet running to the NW. The width between the piers is 200 feet. There is an artificial bank between the Maitland River and the harbor, the river discharging into the lake

through the north beach and not into the harbor. There are clay banks from 60 to 120 feet high on each side of the harbor. Good anchorage off the piers; clay bottom.

The United States is represented by a consul.

**Dues.**—Tonnage dues range from 50 cents to \$5.00.

**Signal Station.**—There is a storm-signal station in the harbor.

**Goderich Main Light.**—A fixed white light, visible 18 (20 $\frac{1}{2}$ ) miles in clear weather, is exhibited 150 feet above the lake level, from a square, white tower, dwelling attached, on the high bank south of the entrance to the harbor.

**Fog Signal.**—An 8-inch steam whistle gives a blast of 10 seconds, duration, followed by a silent interval of 50 seconds.

The fog signal is on the town waterworks building on the beach, SE. by E.  $\frac{1}{4}$  E. from the outer end of the north breakwater. It is 30 feet above the water, and maintained by a corporation.

**Goderich Range Lights.—Front Light.**—A fixed red light, visible 5 (5 $\frac{1}{2}$ ) miles in clear weather, is exhibited 45 feet above the lake level from a square, white, open framework tower, on the north pier about 117 feet from its outer extremity.

**Rear Light.**—A fixed green light, visible 5 (5 $\frac{1}{2}$ ) miles in clear weather, is exhibited 34 feet above the lake level, from a square, white tower on the north pier, 1,509 feet E.  $\frac{3}{4}$  S. from the front light.

These lights in range E.  $\frac{3}{4}$  S. (S. 81° 33' E.) lead to the head of the breakwater.

**Bayfield,** at the mouth of Bayfield River, is 10 (11 $\frac{1}{2}$ ) miles south of Goderich. There is a harbor composed of two piers and a basin. The north pier is 820 feet, and the south, 875 feet long, with a width of 200 feet between them. Depth of water at the entrance, 10 feet.

**Lake View** is 13 (15) miles south of Bayfield, and here the coast commences to bend to the westward to Cape Ipperwash, the end of which is SW. by W. (S. 56° 15' W.) 15 (17 $\frac{1}{2}$ ) miles from Lake View. The reef extends as the cape is approached and surrounds the cape for a distance of 1 $\frac{1}{2}$  (1 $\frac{3}{4}$ ) miles. It is a dangerous reef, having only 5 feet of water a mile from the cape, and from 12 to 16 feet at its outer extremities. Between Cape Ipperwash and Point Harris there are boulders and rocky spots within a mile of the shore. The reef continues 2 (2 $\frac{1}{2}$ ) miles south of Point Harris. At Errol the coast changes direction, becoming steep-to, as far as the entrance to the St. Clair River, a distance of 10 (11 $\frac{1}{2}$ ) miles.

**Point Edward Range Lights** (private lights).—Two fixed lights, white over red, are shown from high open framework towers which are conspicuous day marks. The range is S.  $\frac{3}{4}$  E. (S. 8° 26' E.) and leads 450 feet west of Northwest shoal, the most westerly of the shoal spots.

Lake Huron lightvessel is on this range.

## CHAPTER III.

### ST. CLAIR AND DETROIT RIVERS, AND LAKE ST. CLAIR.

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#### ST. CLAIR RIVER.

St. Clair River, the outlet of Lake Huron, commences at the southern end of this lake, where the shores of the United States and Canada nearly meet. This river, in connection with Lake St. Clair and the Detroit River, forms the link between lakes Huron and Erie. It is 46 miles in length, counting from the 20-foot curve in Lake Huron to the 20-foot curve in Lake St. Clair. As the proposed improvements by dredging will form a continuous deep channel between these curves, it is but right to class them with the river proper, which extends from Fort Gratiot to the mouth of the South Channel.

The proposed channel, from the 20-foot curve in Lake Huron into the river and terminating just inside of Fort Gratiot lighthouse, is to have a depth of 21 feet, with a width of 2,400 feet at the Huron end, which will be continued to the deep water in the St. Clair River. Thence through the river the navigation is easy until leaving the South Channel, when the flats are encountered.

**St. Clair Flats Canal.**—Before the construction of this canal the St. Clair River emptied into Lake St. Clair through seven principal mouths or passes, the one most used being the South Channel. In 1866, in order to obtain a straight channel across the flats, a canal was commenced, and in 1871 finished to a depth of 13 feet, with a width of 300 feet, the channel being bounded on either side by a dike. In 1873 the channel was deepened to 16 feet for a width of 200 feet. In 1893 the project was to dredge the area between the dikes to a depth of 20 feet, and to continue a channel above the canal into the river, and below the canal into the lake.

The northern or river end of this channel was to have a bottom width of 650 feet, and from that to narrow gradually until the dikes were reached. Between the dikes a depth of 20 feet was to be maintained with a width of 300 feet for a distance of 7,221 feet. From the lake end of the dikes the width was to increase gradually until a bottom width of 800 feet should be attained, and this width to be continued to the 20-foot curve. A depth of 20 feet could be carried from this point across Lake St. Clair were it not for the shallow water known as the

**Grosse Pointe Flats.**—On these flats at the ordinary stage of the lakes a depth of 16 feet can be carried, but during low water it is difficult to carry more than 15 feet.

To improve the carrying capacity of this part of the chain of navigation, it is proposed to dredge a channel having a 20-foot depth with a width of 800 feet from the 20-foot curve in Lake St. Clair to the deep water in the Detroit River.

**Detroit River.**—From the southern end of Grosse Pointe channel to the southern end of the ship canal below Amherstburg this river is 32 miles long, with a navigable depth of water for large vessels of from  $\frac{1}{2}$  to  $\frac{1}{2}$  mile in width until the vicinity of Ballards Reef lightboat is reached, whence the channel narrows decidedly and is filled with shoal spots having but 17 feet of water on them.

These spots are about the center of the main channel and extend from the lightboat to Fort Malden. The channel from Fort Malden on is narrow, about  $\frac{1}{2}$  mile, until  $\frac{1}{2}$  mile below Bois Blanc lighthouse; thence to the cut which is to be dredged through the bar the channel widens. This cut is to be 800 feet wide and to carry a depth of 21 feet from the Detroit River into Lake Erie, a distance of  $2\frac{1}{2}$  miles.

#### NORTHERN APPROACH TO ST. CLAIR RIVER.

From Lakeport, in Michigan, the coast of Lake Huron trends SSE.  $\frac{1}{2}$  E. to the mouth of the St. Clair River, and the coast can be approached within  $\frac{1}{2}$  mile until near Lake Huron lightvessel, when the ranges must be taken up for entering the river.

From Errol, on the Canadian side, the coast trends W. by S. and it is safe to approach within  $\frac{1}{2}$  mile until close to Fort Gratiot lighthouse.

In the approach to the river, if coming from the northward, vessels of light draft should pass close to the lightvessel, keeping it to port; vessels of greater draft can find deeper water by keeping the lightvessel to starboard  $1\frac{3}{10}$  ( $1\frac{1}{2}$ ) miles away and continuing to approach the Canadian shore until Fort Gratiot light bears SW. by W.  $\frac{1}{4}$  W. (S.  $59^{\circ} 03' W.$ ), distant 2 ( $2\frac{1}{2}$ ) miles, whence a course WSW.  $\frac{1}{4}$  W. (S.  $70^{\circ} 18' W.$ ) will lead through 4 fathoms until the Fort Gratiot range is made, on which range vessels should enter the river. When the channel is cut from the lake into the river all vessels can use it.

If coming from the eastward, vessels should bring Fort Gratiot light to bear SW. by W.  $\frac{1}{4}$  W. (S.  $59^{\circ} 03' W.$ ), distant 2 ( $2\frac{1}{2}$ ) miles, and then keep a course of WSW.  $\frac{1}{4}$  W. (S.  $70^{\circ} 18' W.$ ) until on the Fort Gratiot range.

The lightvessel, Fort Gratiot light, and the lights of Point Edwards range are referred to in their proper places in the previous chapter.

## DIRECTIONS FOR ST. CLAIR RIVER.

U. S. Engineers' Chart No. 37.

**Fort Gratiot Range.**—On the west bank of this river and near the Grand Trunk Railway freight house and dock at Fort Gratiot is a fixed red light, shown from a telegraph pole surmounted by a white triangle for a day mark; the light is 57 feet above the lake level.

About 300 feet SSW.  $\frac{3}{4}$  W. (S.  $30^{\circ} 56'$  W.) is a second red light at a height of 80 feet above the lake level and shown from a white pyramidal framework tower with a day mark 14 feet long and 10 feet wide.

This range will carry deep water into the river and clear the 20-foot spot lying SE. 300 yards from Fort Gratiot lighthouse.

After passing this 20-foot spot a mid-channel course should be kept until near the mouth of Black River when the deepest water will be found near the Canadian shore; a shoal makes out from the mouth of Black River 1,200 yards to the southward with a greatest width of 500 yards; 12 feet can be carried over this shoal, but a lookout must be kept for some spots of gravel and rock on which there are but 10 feet.

**Buoy.**—A black spar buoy, 25 feet in length, is moored in 15 feet of water (mean depth) to mark the easterly side of this shoal.

**Caution as to Anchorage.**—From Fort Gratiot light to below the rapids the holding ground is rocky and bad. Off Port Huron and Sarnia it is clay and good. Vessels should anchor as close to shore as safety will permit so as to leave the mid-channel clear for passing vessels.

**Black River.**—If intending to enter this river it is well to know that a channel has been dredged from the St. Clair River to Washington avenue. The width varies from 150 feet at the mouth to 50 feet at the upper end. A depth of 14 feet can be depended upon except at extreme low water.

Having cleared the shoal off Black River, a mid-channel course will carry deep water until approaching Stag Island which, with the shoals projecting from its north and south ends, divides the river and forms two narrow but deep channels, through either of which deep water can be carried, remembering that in the Michigan side channel there is a 15-foot spot a little below Stag Island and nearer to the Michigan shore. The Canadian channel is clear.

**Corunna Range (Canadian).**—The front light, a fixed white light, is shown from a white, skeleton-framed tower with an inclosed top, the side facing the water being slatted. It is 48 feet above high water and visible 4 ( $4\frac{1}{2}$ ) miles.

The rear light, a fixed white light, 67 feet above high water, visible 4 ( $4\frac{1}{2}$ ) miles, stands 568 feet S. by E.  $\frac{3}{8}$  E. (S.  $13^{\circ} 21'$  E.) from the front light. It is shown from a square white tower.

Both of these towers are in the village of Corunna, the front light being near the old wharf at the foot of Fane street, whilst the rear light is on the west side of Beresford street. The course S.  $13^{\circ} 21'$  E. carries through the best water in the Canadian Channel past the shoals at the head of Stag Island as also past the shoals off the mouth of Talfords Creek.

**Stag Island.**—The island proper is about  $1\frac{1}{2}$  miles long with a shoal projecting to the northward for nearly  $\frac{1}{2}$  mile.

**Buoy.**—Near the northern edge of this shoal a 25-foot spar buoy, painted in red and black horizontal stripes, is moored in 16 feet of water; the shoal extends a short distance north from this buoy.

There is also a shoal which extends  $\frac{1}{2}$  mile south from the island.

**Buoy.**—A 20-foot spar buoy, painted red and black in horizontal stripes, is moored in 12-feet of water, on this shoal.

**Caution.**—A short distance to the southward from this buoy are two shoal spots of 17 feet water, and one of the same depth west from the buoy and nearly in mid-channel on the Michigan side.

Having passed the shoals near Stag Island, deep water continues for  $1\frac{1}{2}$  ( $1\frac{3}{4}$ ) miles to a shoal nearly in mid-channel and extending from off Mooretown, Canada, to the mouth of the Pine River, Michigan. The shoal water (18 feet) extends for a distance of nearly  $1\frac{3}{4}$  ( $1\frac{1}{2}$ ) miles, with a least depth, opposite St. Clair, of 4 feet. The shoal is marked by two buoys, and is known as St. Clair Middle Ground.

**Buoys.**—A 25-foot spar buoy, painted in red and black horizontal stripes, is moored near the north end of this shoal in 16 feet of water, and is about 650 yards W.  $\frac{1}{4}$  S. from the mouth of Baby Creek, Canada.

A 25-foot spar buoy, painted in red and black horizontal stripes is moored near the south end of this shoal in 17 feet of water and is about 450 yards ENE. from the north side of the mouth of Pine River.

**Pine River.**—This river empties into the St. Clair River at St. Clair. There is a dredged channel from its mouth to the shipyard, 10 feet deep and from 75 to 100 feet wide.

From the shoals off Pine River the channel is clear until Marine City is reached, a distance of  $6\frac{1}{2}$  ( $7\frac{1}{2}$ ) miles. Off Marine City, and just to the northward of Woodtick (Fawn) Island is a shoal nearly one mile long, with a least depth of 16 feet and not buoyed. The main channel is on the Michigan side until Woodtick Island is passed, and there is a narrow channel on the Canadian side.

**Woodtick Island.**—This island with its shoals is  $1\frac{1}{2}$  miles long by  $\frac{3}{4}$  mile wide; the shoals are marked by buoys.

**Buoys.**—A 25-foot spar buoy, painted red and black in horizontal stripes is moored in 16 feet of water on the shoal extending north from Woodtick Island and about 900 yards N. by W.  $\frac{1}{4}$  W. from the northern end of that island; the shoal extends to the northward beyond the buoy.

A 20-foot spar buoy, painted red and black in horizontal stripes is moored in 13 feet of water on the end of the shoal extending to the southward from Woodtick Island and is about 700 yards S. by W.  $\frac{3}{4}$  W. from the south point of that island.

**Belle River.**—This river, on the Michigan side, empties into the St. Clair River just above the northerly end of Woodtick Island, and in the south end of Marine City. It has a dredged channel 50 feet wide and about 11 feet deep from the mouth to the first bridge, and thence to the Broadway bridge a vessel can carry 10 feet.

From the buoy south of Woodtick Island a mid-channel course can be kept until off Babys Point.

Chenal Ecarté (Canadian) is one of the seven mouths of the St. Clair River, and at Babys Point takes its direction to the southeastward. It is very narrow and navigable for vessels drawing 16 feet. About 5 ( $5\frac{1}{4}$ ) miles from Babys Point a second channel (Johnston) makes off to the southward.

About 3 ( $3\frac{1}{2}$ ) miles farther on, Bear Creek empties into Chenal Ecarté. Neither of the channels empty into deep water.

#### FROM BABYS POINT THROUGH SOUTH CHANNEL.

U. S. Engineers' Chart No. 41.

A mid-channel course until the upper range on Russell Island is made.

**Upper Range Lights.**—A fixed red light, No. 12, is shown from a tripod, with a target for a day mark, at a height of 12 feet above the river level.

A second fixed red light, No. 11 (it shows white down stream to Fish dock), 25 feet above the river level, is shown from a mast on a cluster of piles, with a target for a day mark. The piles are in the water abreast a clump of trees on Russell Island and 1,500 feet SSW.  $\frac{1}{4}$  W. (S.  $25^{\circ} 18' W.$ ) from the front light. (This light is also the rear light of the lower range.)

**Buoy.**—A 25-foot spar buoy, painted in red and black horizontal stripes, is moored in 16 feet of water and 900 yards N. by E.  $\frac{1}{4}$  E. (N.  $19^{\circ} 41' E.$ ) from the upper red light on Russell Island.

In proceeding down the south channel bring the range a little on the starboard bow, giving the buoy a clearance of at least  $\frac{1}{8}$  mile. (Keeping this range will carry into 14 feet of water off the buoy.) This course can be carried until the middle light on Russell Island is abeam, when the course should be gradually changed to the southwestward until the lower range on Russell Island can be made.

**Lower Range Lights.**—A fixed white light, No. 10, is shown from a tripod, with a target for a day mark, in the marsh. It is 12 feet above the river level.



A second white light, No. 11, 25 feet above the river level (it shows red upstream to Babys Point), is shown from a mast on a cluster of piles, with a target for a day mark. It is 1,800 feet NE.  $\frac{3}{4}$  N. (N.  $40^{\circ} 46'$  E.) from the front light. (This light is also the rear light of the upper range.)

This range should be made about  $\frac{3}{4}$  mile below the lower white light, and the range can thence be carried to and a little below the Fish dock, when will be made the

**Herson Island Lower Range.**—A fixed white light, No. 8, 12 feet above the river level, is shown from a cluster of piles, with a target for a day mark. It stands in the water. (This light is also the front light of the Herson Island upper range.)

A fixed red light, No. 7, 20 feet above the river level and 1,050 feet SW. by W.  $\frac{1}{4}$  W. (S.  $59^{\circ} 03'$  W.) from No. 8, is shown, in the marsh, from a tripod with a target for a day mark.

Soon after heading on this range should be seen the

**Squirrel Shoal Buoy.**—A 25-foot spar buoy, painted red, moored in 17 feet of water off a shoal on which a depth of 13 feet has been found.

When abreast of this buoy the course should be changed gradually to the southward, keeping closer to the Michigan shore for the deeper water. When a little below the red light, No. 7, of the lower range, a buoy on the Canadian side, should be seen and when it bears nearly south the upper range should be taken.

**Squirrel Island Buoy.**—An 18-foot spar buoy, painted red, is moored in 11 feet of water to mark the edge of the flat off Squirrel Island. It is 800 yards S.  $3^{\circ}$  E. from the red light No. 7.

**Herson Island Upper Range.**—A fixed white light, No. 8, 12 feet above the river level, is shown from a cluster of piles, with a target for a day mark. It stands in the water. (This light is also the front light of the Herson Island lower range.)

A fixed red light, No. 9, 25 feet above the river level, is shown from a tripod, with a target for a day mark. It is 1,200 feet N.  $21^{\circ}$  E. from light No. 8, and with it forms a range which can be carried past Bassett Channel, one of the seven original outlets of the St. Clair River.

Opposite the head of Bassett Channel is the

**Southeast Bend Upper Light,** No. 6, a fixed white and red light, showing from a cluster of piles and 12 feet above the river level. It shows white upstream and when it changes to red the course should be gradually changed to the southwestward for rounding the Southeast Bend. A mid-channel course should be kept past the next two lights.

**Southeast Bend Middle Light.**—No. 5 is a fixed red light, 12 feet above the river level, on a cluster of piles.

**Southeast Bend Lower Light.**—No. 4 is a fixed red and white light, showing the red upstream, and changing to white at the time a vessel should change its course to take the range.

**Lower Reach Lower Range.**—No. 3, the front light of this range, is a fixed white light shown from a cluster of piles with a target for a day mark. It is 12 feet above the river level.

No. 2, the rear light, is a fixed red light, 25 feet above the river level, shown from a tripod with a target for a day mark. It is 1,000 feet N.  $56^{\circ}$  W. from No. 3.

Light No. 2 is also the rear light of the Lower Reach lower range.

This range will carry nearly a mid-channel course through the upper part of the Lower Reach, but do not go too close to the Canadian side. A vessel keeping to the northward of a line joining lights Nos. 4 and 1, will keep off the shoals. Do not go to the northward of a line joining lights Nos. 3 and 4, but on approaching that line, if on the range, the course can be gradually changed to the west and a mid-channel course will carry past the lights until the lower range is nearly made. Do not go to the westward of this lower range.

**Lower Reach Upper Range.**—No. 1, the front light of this range, is a fixed white light 12 feet above the river level. It is shown from a cluster of piles, with a target for a day mark.

No. 2, a fixed red light, 25 feet above the river level and 900 feet N.  $60^{\circ}$  E. from No. 1, is the rear light of this range as also of the upper range.

Vessels should not go northward of this range, but should keep close to it until nearing the Star Island Hotel, when a course more in mid-channel should be kept.

When  $\frac{3}{4}$  mile to the southwestward of Star Island Hotel a course SW.  $\frac{3}{4}$  S. (S.  $40^{\circ} 46'$  W.) with the lighthouse on the upper end of the west pier of the United States Ship Canal nearly ahead, will carry in deep water to the canal. At this entrance to the canal the width is 296 feet. There is a light on each end of the west pier.

**St. Clair Flats Canal Lights.**—A fixed red light visible  $11\frac{1}{4}$  (13) miles, and 45 feet above the river level is shown from an octagonal tower, rising from the corner of a dwelling, both being built of red brick. It is on the NE. end.

A fixed red light visible  $11\frac{1}{4}$  (13) miles, shown from the same description of tower and at the same height above the lake level is on the SW. end of this canal in Lake St. Clair.

#### DIRECTIONS ACROSS LAKE ST. CLAIR.

U. S. Engineers' Chart No. 41.

From the lighthouse on the SW. end of the west pier a course of SW. (S.  $45^{\circ}$  W.) for  $12\frac{1}{2}$  ( $14\frac{1}{2}$ ) miles will carry to the Grosse Pointe Beacon

light, which leave to port, passing between it and the buoy near it. Before reaching the beacon light the vessel will have passed

**Grosse Pointe Lightvessel.**—No. 10 is moored in 16 feet of water,  $1\frac{1}{2}$  ( $1\frac{1}{2}$ ) miles S.  $52^{\circ}$  E. from Grosse Pointe.

The lightvessel is a scow with one mast, with a circular cage-work day mark at the masthead. The hull is painted red with the name in large black letters on each side, and "No. 10" on the stern. The day mark and topmast are painted black.

The light is fixed white, 25 feet above the lake level, and visible in clear weather  $10\frac{1}{2}$  ( $11\frac{1}{2}$ ) miles.

**Fog Signal.**—During thick weather a bell is rung.

**Buoy.**—A 25-foot spar buoy, painted black, is moored 700 feet NW. of the lightvessel. It marks a 15-foot patch.

By the above course, SW., vessels leave the lightvessel and buoy to port, and keep the deepest water shown on the chart.

**Grosse Pointe Beacon Light.**—A fixed red light, 37 feet above the water is shown over a fixed white light, 30 feet above the water, from a cluster of piles 13 feet in diameter. On this beacon is a lamp room surmounted by a mast, from which the lights are shown. There is also a day mark of slats painted white. The beacon is  $2\frac{3}{8}$  miles ENE.  $\frac{1}{2}$  E. (N.  $74^{\circ}$   $32'$  E.) from Windmill Point lighthouse.

**Detroit River (head of) Buoy.**—A 25-foot spar buoy, painted black, is moored in 16 feet of water 400 yards NW. from the beacon.

Vessels should pass between this buoy and beacon and with them abeam should change course to SW. by W.  $\frac{3}{4}$  W. (S.  $64^{\circ}$   $41'$  W.) until abeam of Windmill Point light, distant  $\frac{1}{4}$  mile.

#### DIRECTIONS FOR DETROIT RIVER—MAIN CHANNEL.

U. S. Engineers' Chart No. 56.

**Windmill Point Light.**—A fixed white light varied by a red flash every 15 seconds, visible  $12\frac{1}{2}$  ( $14\frac{3}{4}$ ) miles is exhibited, 55 feet above the lake level, from a conical white tower connected with a red brick dwelling by a covered way. The tower is on Windmill Point, the north side of the entrance to the Detroit River.

The course SW. by W.  $\frac{3}{4}$  W. (S.  $64^{\circ}$   $41'$  W.) will carry in between Windmill Point and Isle aux Peches, which island is surrounded by shoal water with a spit off the west end. This course can be kept until on the

**Windmill Point Range.**—A fixed red light is shown, 34 feet above the river level, from a square, red, pyramidal, skeleton tower, the upper part being inclosed.

A second fixed red light, 49 feet above the river level and visible  $7\frac{1}{2}$  ( $8\frac{1}{2}$ ) miles, is shown from a square, white, skeleton tower, pyramidal in shape, 437 feet NE. from the preceding.

Just before changing the course to the range, two buoys should be seen, one on either bow.

**Belle Isle (east end) Buoy.**—A 25-foot spar buoy, painted red and black in horizontal stripes, is moored in 16 feet of water on the east point of the shoal, off the head of Belle Isle. It is also a mark for the division of the channel, which is divided into two parts by Belle Isle.

This buoy should be made a little on the starboard bow, and on the port bow the

**Isle aux Peches Buoy, No. 8.**—A 25-foot spar buoy, painted red, is moored in 16 feet of water on the edge of the shoal, extending from the west end of the Isle aux Peches.

The range course SW. (S.  $45^{\circ}$  W.), with the lights in line astern, can be kept until Belle Isle light is passed.

**Belle Isle Light.**—A fixed red light, 42 feet above the river level and visible  $11\frac{3}{10}$  (13) miles, is shown from a square tower on a dwelling, both being built of red brick. It is on the SE. point of Belle Isle.

From here a mid-channel course can be kept until close to Fighting Island.

#### NORTHERN CHANNEL.

A vessel standing into the Detroit River and intending to take this channel should change course, when Windmill Point light is abeam, to W.  $\frac{3}{4}$  S. (S.  $85^{\circ} 47'$  W.), which will carry, in deep water, until close to the

**Scott Middle Ground (upper end) Buoys.**—No. 6 is a 16-foot spar buoy, painted red, moored in 18 feet of water on the north point of this middle ground.

A mid-channel course should be kept past buoys Nos. 4 and 2.

No. 4 is a 16-foot spar buoy, moored in 24 feet of water on the NW. point of the middle ground.

No. 2 is a 16-foot spar buoy, moored in 11 feet of water just above the Belle Isle bridge.

Passing through the passage in this bridge a course close to the Detroit side will carry, in deep water, past the

**Belle Isle (west end) Buoy.**—A 25-foot spar buoy, painted red and black in horizontal stripes, is moored in 13 feet of water on the end of the shoal extending to the southeastward from Belle Isle. A mid-channel course can be held to near Fighting Island. When one mile south of the coal chutes, which will be one mile north of Fighting Island, the course should be gradually changed to the southwestward, keeping Fighting Island to port.

#### MAIN CHANNEL—CONTINUED.

Continue a mid-channel course between Fighting Island and Grassy Island until abeam of and at least 950 feet eastward from

**Grassy Island Light.**—A fixed white light, varied by a white flash every minute and visible  $11\frac{9}{10}$  ( $13\frac{1}{2}$ ) miles, is exhibited from a lantern surmounting a square, cream-colored tower attached to a dwelling built on submerged piles and surrounded by a cofferdam. It stands in 5 feet of water.

From here a course of S.  $\frac{1}{2}$  W. (S.  $8^{\circ} 26' W.$ ) will carry, on the Mamajuda range, to a point about  $\frac{1}{2}$  mile from the red light.

**Mamajuda Range Light.**—A fixed red light, on Mamajuda Shoal, in  $3\frac{1}{2}$  feet of water, is shown from a square, white, pyramidal tower on a platform supported by piles. It is 28 feet above the river level and 600 feet N.  $\frac{1}{2}$  E. (N.  $8^{\circ} 26' E.$ ) from Mamajuda light.

This light illuminates an arc of  $120^{\circ}$ , between W.  $\frac{1}{2}$  N. (N.  $81^{\circ} 33' W.$ ) to S. by E.  $\frac{1}{2}$  E. (S.  $21^{\circ} 05' E.$ ).

With Mamajuda light as a rear light, it forms a range marking the best water from a point 950 feet eastward of Grassy Island light to a point  $\frac{1}{2}$  mile from this red light.

From this point a course of south should be made until abeam of Mamajuda light or on Grosse Isle, upper range.

**Mamajuda Light.**—A fixed red light, visible  $11\frac{3}{10}$  (13) miles, is exhibited from a low, square tower on a white dwelling built on piles. The tower is connected with the islet by a short foot-bridge. It stands in 3 feet of water 200 feet from the edge of the channel.

The range formed by this light with Grassy Point light can be used north of Grassy Point south of Mamajuda, or between the two, care being taken not to approach Mamajuda on the south nearer than 500 yards nor on the north nearer than 1,100 yards. Nor should it be carried nearer to Grassy Point than 900 yards.

When abeam of Mamajuda light, or, if possible, sooner, shape a course on the upper range of Grosse Isle, S. by W.  $\frac{1}{2}$  W. (S.  $12^{\circ} 39' W.$ ).

**Grosse Isle, Upper Range.**—Two fixed white lights, each shown from a square, brown, pyramidal framework tower, with a small white house with a red roof at its base.

The front light is 45 feet above the river level in  $3\frac{1}{2}$  feet of water.

The rear light is 75 feet above the river level, 450 feet from the shore, and about 1,350 feet S. by W.  $\frac{1}{2}$  W. (S.  $12^{\circ} 39' W.$ ) from the front light.

Each light illuminates S.  $90^{\circ}$  of the horizon between WSW.  $\frac{3}{4}$  W. (S.  $71^{\circ} 43' W.$ ) and S. by E.  $\frac{1}{2}$  E. (S.  $18^{\circ} 16' E.$ ).

This range marks the best water from a point 750 feet eastward of Mamajuda light to the intersection with the Grosse Isle, lower range, up the river.

Keep the course until the lower range is made, when change course to S. by E.  $\frac{1}{2}$  E. (S.  $18^{\circ} 16' E.$ ) with the lights in line astern.

**Grosse Isle, Lower Range.**—The front light is a fixed white lens lantern, 71 feet above the river level and shown from a brown, triangular, skeleton iron pyramid. This is built on a crib about 3,000 feet S.  $36^{\circ}$  W. of Mamajuda lighthouse.

The rear light, about 1,493 feet N. by W.  $\frac{1}{2}$  W. (N.  $16^{\circ}$   $52'$  W.) from the preceding, is a fixed white light shown from a tower similar to the front light tower and 103 feet above the river level.

The course S. by E.  $\frac{3}{4}$  E. (S.  $18^{\circ}$   $16'$  E.) will carry through about 17 feet of water until the Limekiln Crossing Range (Canadian) can be made, passing on the way:

**A Red Spar Buoy**, in  $9\frac{1}{2}$  feet of water on the east side of the channel, which marks the edge of the bank at the lower end of Fighting Island:

**A Black Stake Buoy.**—A 25-foot spar buoy, standing in a sandy bottom at the elbow of the flat and about 1,000 feet N.  $25^{\circ}$  W. from

**Ballards Reef Lightboat**, a small flat-bottom scow, with a trunk cabin, painted red, with name in white letters on each side. It shows a fixed red light visible 5 ( $5\frac{1}{4}$ ) miles. The boat is moored off the easterly end of Ballards Reef in 18 feet of water:

**Fog Signal.**—During thick and foggy weather a bell will be struck by hand.

**A Red Spar Buoy**, on the 3-fathom curve of the bank SW. from the mouth of the River aux Canards.

The bed of this range was swept with a horizontal bar suspended from a flat-boat and numerous bowlders were found with but 17 to 18 feet of water over them. These bowlders are dangerously near the range, consequently no passage can be described for a 20-foot ship until a complete survey is made. The passage through this portion of the river can be made by vessels drawing not over 17 feet, but as it is probable that these bowlders are scattered over the entire bed of this section of the river great caution must be observed.

**A Red Can Buoy** off Dougalls rock.

The course S.  $18^{\circ}$   $16'$  E. can be carried for nearly  $3\frac{1}{2}$  (4) miles until abeam of the

**Limekiln Crossing (North) Lightvessel, No. 65.**—A small flat-bottom scow, with a trunk cabin, painted white, with name in red letters on each side. From it is shown a fixed white light visible 5 ( $5\frac{1}{4}$ ) miles. It is moored on the easterly side of the north end of the cut at Limekiln Crossing but on the west side of the passage through on the

**Limekiln Crossing Range (Canadian).**—The front light of this range is on a pier on the shoal off Fort Malden, above Amherstburg. It is a fixed white light, 31 feet above the river level and visible 2 ( $2\frac{1}{4}$ ) miles. It is shown from a white skeleton tower surmounted by a metal lantern.

The rear light is fixed red, visible  $2\frac{1}{4}$  miles, and 51 feet above the river level, shown from a red skeleton tower surmounted by a metal lantern. The tower is on a pier 890 feet S.  $10^{\circ}$  E. (S.  $1^{\circ} 07'$  E.) from the front light.

While heading down to the Limekiln Crossing range a range on the Canadian side will be seen. This range is private, belonging to Duff and Gatfield and is nearly on the alignment of the Grosse Isle lower range, the points of intersection with the Limekiln Crossing range differing about 600 feet.

When on Limekiln Crossing range head through the cut, a distance of 2,500 feet until abeam of the South Limekiln Crossing lightvessel.

This cut is 440 feet wide, the Canadian range leading through the center of it.

There is a private range on Texas dock, which also leads through the cut a little east of the Government range.

**Limekiln Crossing (South) Lightvessel**, No. 64, is similar in all respects to No. 65 except that it is moored on the south end of the cut.

When abeam of this lightvessel the Bois Blanc Island range should be seen.

**Head of Bois Blanc Island Range (Canadian).**—The front light, 300 feet from the extreme north point of the island, is fixed white, visible  $2\frac{1}{4}$  miles and shown from a white tripod with an oval target on top. It is 70 feet above the river level.

The rear light, 150 yards S. by W.  $\frac{1}{2}$  W. (S.  $16^{\circ} 52'$  W.) from the front light, is fixed red, visible,  $2\frac{1}{4}$  miles and shown from a red tripod with an oval target on top. It is 90 feet above the river level.

Head on this range and so continue until abeam of

**A Red Can Buoy** on the Canadian side, or on a range of private lights, close to the buoy.

A near mid-channel course should now be kept until the Amherstburg range is made. It is preferable to keep on the Bois Blanc Island side to clear

**A Red Spar Buoy** marking the New York bowlders.

After passing this buoy a

**Black Spar Buoy** will be passed abreast of the lumber dock and when abeam of Bois Blanc lighthouse another black stake buoy should be seen, both on the Bois Blanc side.

**Amherstburg Range** is maintained by the Lake Carriers' Association of Buffalo, N. Y.

The front light is fixed red, visible  $8\frac{1}{4}$  miles and shown from a square, white tower, 56 feet above the river level. The tower is 80 feet from the water and 2,300 feet north of Frasers dock.

The rear light is fixed red, visible 8 ( $9\frac{1}{4}$ ) miles and shown from a square, red tower, 80 feet above the river level. It is 475 feet N. by E.  $\frac{3}{4}$  E. easterly (N.  $16^{\circ} 30'$  E.) from the front light.

Stand down the river with the range in line astern heading S.  $16^{\circ} 30'$  W. passing

**Bois Blanc Light.**—A fixed white light, visible 14 ( $16\frac{1}{4}$ ) miles, is on the south end of Bois Blanc Island. It is shown from a circular white tower with a dwelling on the east side. The lantern is red.

Below Bois Blanc light, the following buoys will be passed:

**A Black Can Buoy**, about 1,400 feet S.  $5^{\circ}$  W. from Bois Blanc light.

**A Black Can Buoy**, about 4,000 feet S.  $16^{\circ}$  W. from Bois Blanc light.

Opposite this buoy and 1,200 feet S.  $75^{\circ}$  E. from it is

**A Red Can Buoy**, and 3,900 feet S.  $19^{\circ}$  W. from this buoy is

**A Shoal (Pontiac)** with  $15\frac{1}{2}$  feet over it, hard bottom. It is on the Amherstburg range. This shoal should be kept to the eastward for better water. Resume the range after passing the shoal which will carry in deep water to the black buoy close to the Bar Point light vessel, passing on the way

**A Red Can Buoy**, 3,700 feet S.  $6^{\circ}$  W. from Pontiac Shoal.

**A Red Spar Buoy**, 1,400 feet S.  $60^{\circ}$  E. from Bar Point light vessel.

**A Black Spar Buoy**, 500 feet S.  $60^{\circ}$  E. from Bar Point light vessel.

Pass this buoy close to keeping it to starboard and change course to S. by W.  $\frac{1}{4}$  W. westerly (S.  $20^{\circ}$  W.) which will carry past the following:

**Bar Point Lightvessel**, No. 59, is moored in 17 feet of water off Bar Point Shoal. It is schooner rigged, two masts, no bowsprit. The light is fixed white, shown from three lanterns encircling the fore masthead. It is visible  $11\frac{7}{8}$  ( $13\frac{1}{2}$ ) miles. There is a circular black cage-work day mark at the fore masthead and a small black smokestack and fog signal between the masts. The hull is black with "No. 59, Bar Point Shoal" in white letters on each side.

**Fog Signal.**—A 6-inch steam whistle sounds a blast of 10 seconds every 30 seconds. If the whistle be disabled a bell will be rung by hand.

**A Black Spar Buoy**, about 1,550 feet S.  $10^{\circ}$  W. from the lightvessel.

**A Black Spar Buoy**, about 3,350 feet S.  $17^{\circ}$  W. from the lightvessel.

On the port hand should be seen

**A Red Spar Buoy**, about 1,500 feet N.  $60^{\circ}$  E. from the last black buoy.

**A Red Spar Buoy**, about 4,100 feet S.  $4^{\circ}$  W. from the latter.

**A Red Spar Buoy**, about 5,800 feet S.  $32^{\circ}$  E. from the last.

When clear of the last black buoy a course can be shaped into Lake Erie.

When the deep-water channel is finished, run down on the Amherstburg range until Bois Blanc light bears N.  $\frac{3}{4}$  E. easterly (N.  $10^{\circ} 30'$  E.) when a course S.  $10^{\circ}$  W. will, with Bois Blanc light astern and Bar Point light ahead, carry to and through the channel and on to Bar Point light, which can be passed on either hand.



## LAKE ST. CLAIR.

Lake St. Clair is of irregular shape, being  $8\frac{1}{2}$  miles wide and  $26\frac{1}{2}$  miles long from New Baltimore on the north to Belle River on the south. Anchor Bay, the northwestern section of the lake is cut off by a bar with a least depth of 8 feet over it at the center. This bar extends across from the mouth of the Clinton River to the mouth of the Chenal Aboutron.

New Baltimore and Fairhaven are on the north shore of the bay, the former having 8 feet and the latter 6 feet off the ends of the wharves.

Ten miles south of New Baltimore is Point Huron with shoal water off it. From here to Milk River Point there is but 12 feet of water  $1\frac{1}{4}$  miles from shore. From here to Windmill Point, vessels drawing 12 feet should not approach the shore nearer than  $\frac{1}{2}$  mile. On the south shore Belle River Station is the only town of any size between the Detroit River and the Thames River. The 12-foot curve is from one mile to  $2\frac{1}{2}$  miles off this coast.

The Thames at the SE. end of this lake is the only river of any importance on the Canadian side, and at its mouth are range lights.

**Thames River Lights.**—A fixed white light, visible 12 ( $13\frac{1}{2}$ ) miles, is shown from a circular, white tower. It is on the south shore of the mouth of the river.

A fixed white light, visible 6 (7) miles, is shown from a square, red tower. It is 300 feet NW.  $\frac{1}{2}$  N. (N.  $39^{\circ} 22'$  W.) from the main light. These two lights in one lead over the bar. This bar has a least depth of 7 feet.

From the Thames River the coast trends nearly north to Mitchel Point and north and west of the point is Mitchel Bay.

From the east shore the 12-foot curve averages the same distance as it does from the south shore.

The north shore from Mitchel Point to the United States Ship Canal is low and marshy, with shoal water extending off over 2 miles.

The course from the mouth of the ship canal to the bar of the Thames River is SE.

The middle of this lake has an average depth of  $3\frac{1}{2}$  fathoms, mud and clay.

Anchor Bay can be approached through the north channel, but this has a bar of 8 feet least water at its mouth.

## CHAPTER IV.

### RULES OF THE ROAD

FOR THE GREAT LAKES AND THEIR CONNECTING AND TRIBUTARY  
WATERS AS FAR EAST AS MONTREAL.

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APPROVED, FEBRUARY 8, 1895.

"ALL LAWS OR PARTS OF LAWS, SO FAR AS APPLICABLE TO THE NAVIGATION OF THE GREAT LAKES AND THEIR CONNECTING AND TRIBUTARY WATERS AS FAR EAST AS MONTREAL, INCONSISTENT WITH THE FOREGOING RULES ARE HEREBY REPEALED.

"THAT THIS ACT SHALL TAKE EFFECT ON AND AFTER MARCH FIRST, EIGHTEEN HUNDRED AND NINETY-FIVE."

SEE RULE 28, ARTICLES 4 AND 5.

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[PUBLIC—No. 41.]

An Act to regulate navigation on the Great Lakes and their connecting and tributary waters.

*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,* That the following rules for preventing collisions shall be followed in the navigation of all public and private vessels of the United States upon the Great Lakes and their connecting and tributary waters as far east as Montreal.

#### STEAM AND SAIL VESSELS.

RULE 1. Every steam vessel which is under sail and not under steam, shall be considered a sail vessel; and every steam vessel which is under steam, whether under sail or not, shall be considered a steam vessel. The word steam vessel shall include any vessel propelled by machinery. A vessel is under way within the meaning of these rules when she is not at anchor or made fast to the shore or aground.

#### LIGHTS.

RULE 2. The lights mentioned in the following rules and no others shall be carried in all weathers from sunset to sunrise. The word visible in these rules when applied to lights shall mean visible on a dark night with a clear atmosphere.

**RULE 3.** Except in the cases hereinafter expressly provided for, a steam vessel when under way shall carry :

(a) On or in front of the foremast, or if a vessel without a foremast, then in the fore part of the vessel, at a height above the hull of not less than twenty feet, and if the beam of the vessel exceeds twenty feet, then at a height above the hull not less than such beam, so, however, that such height need not exceed forty feet, a bright white light so constructed as to show an unbroken light over an arc of the horizon of twenty points of the compass, so fixed as to throw the light ten points on each side of the vessel, namely, from right ahead to two points abaft the beam on either side, and of such character as to be visible at a distance of at least five miles.

(b) On the starboard side, a green light, so constructed as to throw an unbroken light over an arc of the horizon of ten points of the compass, so fixed as to throw the light from right ahead to two points abaft the beam on the starboard side, and of such a character as to be visible at a distance of at least two miles.

(c) On the port side, a red light, so constructed as to show an unbroken light over an arc of the horizon of ten points of the compass, so fixed as to throw the light from right ahead to two points abaft the beam on the port side, and of such a character as to be visible at a distance of at least two miles.

(d) The said green and red lights shall be fitted with inboard screens projecting at least three feet forward from the light, so as to prevent these lights from being seen across the bow.

(e) A steamer of over one hundred and fifty feet register length shall also carry when under way an additional bright light similar in construction to that mentioned in subdivision (a), so fixed as to throw the light all around the horizon and of such character as to be visible at a distance of at least three miles. Such additional light shall be placed in line with the keel at least fifteen feet higher from the deck and more than seventy-five feet abaft the light mentioned in subdivision (a).

#### VESSELS TOWING.

**RULE 4.** A steam vessel having a tow other than a raft shall in addition to the forward bright light mentioned in subdivision (a) of rule three carry in a vertical line not less than six feet above or below that light a second bright light of the same construction and character and fixed and carried in the same manner as the forward bright light mentioned in said subdivision (a) of rule three. Such steamer shall also carry a small bright light abaft the funnel or after mast for the tow to steer by, but such light shall not be visible forward of the beam.

**RULE 5.** A steam vessel having a raft in tow shall, instead of the forward lights mentioned in rule four, carry on or in front of the foremast,

or if a vessel without a foremast then in the fore part of the vessel, at a height above the hull of not less than twenty feet, and if the beam of the vessel exceeds twenty feet, then at a height above the hull not less than such beam, so however that such height need not exceed forty feet, two bright lights in a horizontal line athwartships and not less than eight feet apart, each so fixed as to throw the light all around the horizon and of such character as to be visible at a distance of at least five miles. Such steamer shall also carry the small bright steering light aft, of the character and fixed as required in rule four.

**RULE 6.** A sailing vessel under way and any vessel being towed shall carry the side lights mentioned in rule three.

A vessel in tow shall also carry a small bright light aft, but such light shall not be visible forward of the beam.

**RULE 7.** The lights for tugs under thirty tons register whose principal business is harbor towing, and for boats navigating only on the River Saint Lawrence, also ferryboats, rafts, and canal boats, shall be regulated by rules which have been or may hereafter be prescribed by the Board of Supervising Inspectors of Steam Vessels.

**RULE 8.** Whenever, as in the case of small vessels under way during bad weather, the green and red sidelights can not be fixed, these lights shall be kept at hand lighted and ready for use, and shall, on the approach of or to other vessels, be exhibited on their respective sides in sufficient time to prevent collision, in such manner as to make them most visible, and so that the green light shall not be seen on the port side, nor the red light on the starboard side, nor, if practicable, more than two points abaft the beam on their respective sides. To make the use of these portable lights more certain and easy, they shall each be painted outside with the color of the light they respectively contain, and shall be provided with suitable screens.

**RULE 9.** A vessel under one hundred and fifty feet register length, when at anchor, shall carry forward, where it can best be seen, but at a height not exceeding twenty feet above the hull, a white light in a lantern constructed so as to show a clear, uniform, and unbroken light, visible all around the horizon, at a distance of at least one mile.

A vessel of one hundred and fifty feet or upward in register length, when at anchor, shall carry in the forward part of the vessel, at a height of not less than twenty and not exceeding forty feet above the hull, one such light, and at or near the stern of the vessel, and at such a height that it shall be not less than fifteen feet lower than the forward light, another such light.

**RULE 10.** Produce boats, canal boats, fishing boats, rafts, or other water craft navigating any bay, harbor, or river by hand power, horse power, sail, or by the current of the river, or which shall be anchored or moored

in or near the channel or fairway of any bay, harbor, or river, and not otherwise provided for in these rules, shall carry one or more good white lights, which shall be placed in such manner as shall be prescribed by the Board of Supervising Inspectors of Steam Vessels.

**RULE 11.** Open boats shall not be obliged to carry the side lights required for other vessels, but shall, if they do not carry such lights, carry a lantern having a green slide on one side and a red slide on the other side; and on the approach of or to other vessels, such lantern shall be exhibited in sufficient time to prevent collision, and in such a manner that the green light shall not be seen on the port side, nor the red light on the starboard side. Open boats, when at anchor or stationary, shall exhibit a bright white light. They shall not, however, be prevented from using a flare-up in addition if considered expedient.

**RULE 12.** Sailing vessels shall at all times, on the approach of any steamer during the nighttime, show a lighted torch upon that point or quarter to which such steamer shall be approaching.

**RULE 13.** The exhibition of any light on board of a vessel of war or revenue cutter of the United States may be suspended whenever, in the opinion of the Secretary of the Navy, the commander in chief of a squadron, or the commander of a vessel acting singly, the special character of the service may require it.

#### FOG SIGNALS.

**RULE 14.** A steam vessel shall be provided with an efficient whistle, sounded by steam or by some substitute for steam, placed before the funnel not less than eight feet from the deck, or in such other place as the local inspectors of steam vessels shall determine, and of such character as to be heard in ordinary weather at a distance of at least two miles, and with an efficient bell, and it is hereby made the duty of the United States local inspectors of steam vessels when inspecting the same to require each steamer to be furnished with such whistle and bell. A sailing vessel shall be provided with an efficient fog horn and with an efficient bell.

Whenever there is thick weather by reason of fog, mist, falling snow, heavy rainstorms, or other causes, whether by day or by night, fog signals shall be used as follows:

(a) A steam vessel under way, excepting only a steam vessel with raft in tow, shall sound at intervals of not more than one minute three distinct blasts of her whistle.

(b) Every vessel in tow of another vessel shall, at intervals of one minute, sound four bells on a good and efficient and properly placed bell as follows: By striking the bell twice in quick succession, followed by a little longer interval, and then again striking twice in quick succession (in the manner in which four bells is struck in indicating time).

(c) A steamer with a raft in tow shall sound at intervals of not more than one minute a screeching or Modoc whistle for from three to five seconds.

(d) A sailing vessel under way and not in tow shall sound at intervals of not more than one minute—

If on the starboard tack with wind forward of abeam, one blast of her fog horn;

If on the port tack with wind forward of the beam, two blasts of her fog horn;

If she has the wind abaft the beam on either side, three blasts of her fog horn.

(e) Any vessel at anchor and any vessel aground in or near a channel or fairway shall at intervals of not more than two minutes ring the bell rapidly for three to five seconds.

(f) Vessels of less than ten tons registered tonnage, not being steam vessels, shall not be obliged to give the above-mentioned signals, but if they do not they shall make some other efficient sound signal at intervals of not more than one minute.

(g) Produce boats, fishing boats, rafts, or other water craft navigating by hand power or by the current of the river, or anchored or moored in or near the channel or fairway and not in any port, and not otherwise provided for in these rules, shall sound a fog horn, or equivalent signal, at intervals of not more than one minute.

RULE 15. Every vessel shall, in thick weather, by reason of fog, mist, falling snow, heavy rainstorms, or other causes, go at moderate speed. A steam vessel hearing, apparently not more than four points from right ahead, the fog signal of another vessel shall at once reduce her speed to bare steerageway, and navigate with caution until the vessels shall have passed each other.

## STEERING AND SAILING RULES.

### SAILING VESSELS.

RULE 16. When two sailing vessels are approaching one another so as to involve risk of collision one of them shall keep out of the way of the other, as follows, namely:

(a) A vessel which is running free shall keep out of the way of a vessel which is closehauled.

(b) A vessel which is closehauled on the port tack shall keep out of the way of a vessel which is closehauled on the starboard tack.

(c) When both are running free, with the wind on different sides, the vessel which has the wind on the port side shall keep out of the way of the other.

(d) When they are running free, with the wind on the same side, the vessel which is to windward shall keep out of the way of the vessel which is to leeward.

STEAM VESSELS.

RULE 17. When two steam vessels are meeting end on, or nearly end on, so as to involve risk of collision each shall alter her course to starboard, so that each shall pass on the port side of the other.

RULE 18. When two steam vessels are crossing so as to involve risk of collision the vessel which has the other on her own starboard side shall keep out of the way of the other.

RULE 19. When a steam vessel and a sailing vessel are proceeding in such directions as to involve risk of collision the steam vessel shall keep out of the way of the sailing vessel.

RULE 20. Where, by any of the rules herein prescribed, one of two vessels shall keep out of the way, the other shall keep her course and speed.

RULE 21. Every steam vessel which is directed by these rules to keep out of the way of another vessel shall, on approaching her, if necessary, slacken her speed or stop or reverse.

RULE 22. Notwithstanding anything contained in these rules every vessel overtaking any other shall keep out of the way of the overtaken vessel.

RULE 23. In all weathers every steam vessel under way in taking any course authorized or required by these rules shall indicate that course by the following signals on her whistle, to be accompanied whenever required by corresponding alteration of her helm; and every steam vessel receiving a signal from another shall promptly respond with the same signal or, as provided in rule twenty-six:

One blast to mean, "I am directing my course to starboard."

Two blasts to mean, "I am directing my course to port." But the giving or answering signals by a vessel required to keep her course shall not vary the duties and obligations of the respective vessels.

RULE 24. That in all narrow channels where there is a current, and in the rivers Saint Mary, Saint Clair, Detroit, Niagara, and Saint Lawrence, when two steamers are meeting, the descending steamer shall have the right of way, and shall, before the vessels shall have arrived within the distance of one-half mile of each other, give the signal necessary to indicate which side she elects to take.

RULE 25. In all channels less than five hundred feet in width, no steam vessel shall pass another going in the same direction unless the steam vessel ahead be disabled or signify her willingness that the steam vessel astern shall pass, when the steam vessel astern may pass, subject, however, to the other rules applicable to such a situation. And when steam vessels proceeding in opposite directions are about to meet in such channels, both such vessels shall be slowed down to a moderate speed, according to the circumstances.

**RULE 26.** If the pilot of a steam vessel to which a passing signal is sounded deems it unsafe to accept and assent to said signal, he shall not sound a cross signal; but in that case, and in every case where the pilot of one steamer fails to understand the course or intention of an approaching steamer, whether from signals being given or answered erroneously, or from other causes, the pilot of such steamer so receiving the first passing signal, or the pilot so in doubt, shall sound several short and rapid blasts of the whistle; and if the vessels shall have approached within half a mile of each other both shall reduce their speed to bare steerageway, and, if necessary, stop and reverse.

**RULE 27.** In obeying and construing these rules due regard shall be had to all dangers of navigation and collision and to any special circumstances which may render a departure from the above rules necessary in order to avoid immediate danger.

**RULE 28.** Nothing in these rules shall exonerate any vessel, or the owner or master or crew thereof, from the consequences of any neglect to carry lights or signals, or of any neglect to keep a proper lookout, or of a neglect of any precaution which may be required by the ordinary practice of seamen, or by the special circumstances of the case.

**SEC. 2.** That a fine not exceeding two hundred dollars, may be imposed for the violation of any of the provisions of this Act. The vessel shall be liable for the said penalty, and may be seized and proceeded against, by way of libel, in the district court of the United States for any district within which such vessel may be found.

**SEC. 3.** That the Secretary of the Treasury of the United States shall have authority to establish all necessary regulations, not inconsistent with the provisions of this Act, required to carry the same into effect.

The Board of Supervising Inspectors of the United States shall have authority to establish such regulations to be observed by all steam vessels in passing each other, not inconsistent with the provisions of this Act, as they shall from time to time deem necessary; and all regulations adopted by the said Board of Supervising Inspectors under the authority of this Act, when approved by the Secretary of the Treasury shall have the force of law. Two printed copies of any such regulations for passing, signed by them, shall be furnished to each steam vessel, and shall at all times be kept posted up in conspicuous places on board.

**SEC. 4.** That all laws or parts of laws, so far as applicable to the navigation of the Great Lakes and their connecting and tributary waters as far east as Montreal, inconsistent with the foregoing rules are hereby repealed.

**SEC. 5.** That this Act shall take effect on and after March first, eighteen hundred and ninety-five.

Approved, February 8, 1895.



## CHAPTER V.

### SIGNALS.

#### UNITED STATES AND CANADA.

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##### U. S. DEPARTMENT OF AGRICULTURE.

INSTRUCTIONS }  
No 109. }

WEATHER BUREAU,

WASHINGTON, D. C., *November, 13, 1894.*

Beginning December 1, 1894, the information signals displayed at stations on the Great Lakes will indicate the expected direction of the wind, whether easterly or westerly. The red pennant will be used to indicate easterly winds, and the white pennant westerly winds. Orders to hoist these signals will specify the expected direction. Attention is called to the fact that the information signal when used at Lake stations is not a notification that a storm is expected at other Lake stations, but as warning that winds dangerous to tows and small vessels may occur at the station displaying this signal.

##### U. S. DEPARTMENT OF AGRICULTURE,

INSTRUCTIONS }  
No. 120. }

WEATHER BUREAU,

WASHINGTON, D. C., *December, 6 1894.*

In addition to the Information and Storm signals at present in use by this Bureau, the adoption of an additional wind signal, to be known as the "Hurricane Signal," is hereby announced, to take effect January 1, 1895.

This signal will consist of two red flags with black centers, displayed one above the other, and will be used to announce the expected approach of tropical hurricanes, and also of those extremely severe and dangerous storms which occasionally move across the Lakes and the northern Atlantic coast.

The flags will be the same as the one now used for the distinctive storm signal, the pennants being omitted. No distinctive night hurricane signal will be displayed, but when this signal is ordered during the day and is not lowered or changed before dark, the night storm signal will be displayed, the direction to be determined by the information contained in the message accompanying the order to hoist.

## SIGNALS OF DISTRESS.

The Board of Trade gives notice that on and after the first of November, 1873, the following signals shall, in accordance with the 18th section of the Merchant Shipping Act, 1873, be deemed to be signals of distress :

**In the Daytime.**—The following signals, numbered 1, 2, and 3, when used or displayed together or separately, shall be deemed to be signals of distress in the daytime :

“1. A gun fired at intervals of about a minute.

“2. The International Code Signal of Distress, indicated N. C.

“The Distant Signal, consisting of a square flag, having either above or below it a ball, or anything resembling a ball.

**At Night.**—The following signals, numbered 1, 2, and 3, when used or displayed together or separately, shall be deemed to be signals of distress at night :













“1. A gun fired at intervals of about a minute.

“2. Flames on the ship (as from a burning tar barrel, oil barrel, etc).

“Rockets or shells of any color or description, fired one at a time, at short intervals.”

And “any master of a vessel who uses or displays, or causes or permits any person under his authority to use or display any of the said signals, except in the case of a vessel being in distress, shall be liable to pay compensation for any labor undertaken, risk incurred, or loss sustained in consequence of such signal having been supposed to be a signal of distress, and such compensation may, without prejudice to any other remedy, be recovered in the same manner in which salvage is recoverable.”





## U.S. WEATHER AND TEMPERATURE SIGNALS

					
fair weather; stationary temperature	rain or snow; stationary temperature	local rain; stationary temperature	cold wave	fair weather; warmer	fair weather; colder
					
warmer weather; rain or snow	colder weather; rain or snow	warmer weather with local rains	colder weather with local rains	fair weather; cold wave	wet weather; cold wave

## U.S. INFORMATION SIGNALS

		
Hurricane	Easterly winds	Westerly winds

## U.S. STORM SIGNALS

			
N.W'y winds	S.W'y winds	S.E'y winds	N.E'y winds

Flags 8 feet square. Pennants 5 feet hoist and 12 feet fly.  
White centers 4 feet square, black centers 3 feet square.

*The Hurricane Signal indicates the expected approach of a tropical hurricane or of one of the dangerous storms which occasionally move across the lakes.*

*The Storm Signal indicates that the storm is expected to be of marked violence and dangerous to all classes of vessels.*

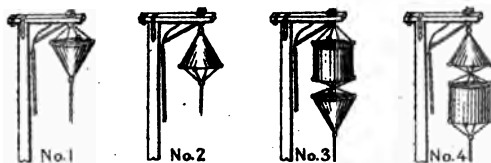
*The pennants when displayed alone indicate the expected direction of the wind.*

*NIGHT SIGNALS — By night a red light will indicate easterly winds and a white light above a red light, westerly winds.*



## CANADIAN STORM SIGNALS

### DAY SIGNALS



Day Signal	If displayed on Lakes Superior Erie or Ontario indicates :	If displayed on Lake Huron or in Georgian Bay indicates :
No. 1	a moderate gale is expected at first from an Easterly direction.	a moderate gale is expected at first from a Southerly direction.
No. 2	a heavy gale is expected at first from a Westerly direction.	a heavy gale is expected at first from a Northerly direction.
No. 3	a heavy gale is expected at first from an Easterly direction.	a heavy gale is expected at first from a Southerly direction.
No. 4	a heavy gale is expected at first from a Westerly direction.	a heavy gale is expected at first from a Northerly direction.

*The Cone when displayed alone indicates that it is expected that the wind will attain a velocity of 25 miles an hour, but will not exceed 35 miles, and it is not intended to indicate that an ordinary, wellfound vessel should stay in port but is simply a warning that strong winds are expected from the quarter indicated.*

*The Drum will always be hoisted when the velocity of the wind is expected to exceed 35 miles an hour.*

### NIGHT SIGNALS

*The Night Signal corresponding to Day Signals Nos. 1 and 3 is two lanterns hanging one above the other.*

*The Night Signal corresponding to Day Signals Nos. 2 and 4 is two lanterns hanging side by side.*

*October and November are the months in which severe storms most frequently occur on the Lakes. In these fall storms on lakes Erie and Ontario, the wind almost invariably commences at the southeast and works round through south to west and northwest, and the time of the hardest blow is usually when the barometer begins to rise as the wind gets around to the west. On Lake Huron and in Georgian Bay, the wind, though for the most part changing as on the Lower Lakes, not unfrequently changes with great suddenness, chopping after a lull from south-southeast to northwest, and blowing hardest, as a rule, from the northwest.*

THE  
HISTORY  
OF  
THE  
CITY  
OF  
NEW-YORK  
FROM  
1609 TO 1812  
BY  
JOHN B. HEATON  
NEW-YORK  
PUBLISHED BY  
J. B. HEATON  
1812

## **CHAPTER VI.**

### **BRIEF RULES FOR THE USE OF OIL.**





# BRIEF RULES FOR THE USE OF OIL TO PROTECT VESSELS IN STORMY WATERS.

From the prize essay submitted to the Hamburg Nautical School by Captain R. Karlowa of the Hamburg American Steamship Company.

*In the illustrative figures, the flowing lines represent the spreading oil and the arrows denote the direction of the wind and sea.*

Fig. 1

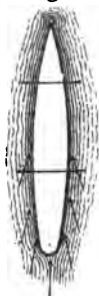


Fig. 2



Scudding before a gale, figure 1, distribute oil from the bow by means of oil-bags or through waste-pipes, it will thus spread aft and give protection both from quarring and following seas.

If only distributed astern, figure 2, there will be no protection from the quarring sea.

Fig. 3

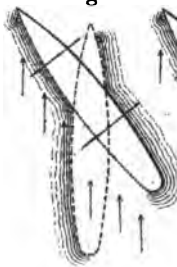


Fig. 4



Running before a gale, yawing badly and threatening to broach-to, figures 3 and 4, oil should be distributed from the bow and from both sides, abaft the beam.

In, figure 3, for instance where it is only distributed at the bow, the weather quarter is left unprotected when the ship yaws.

In, figure 4, however, with oil-bags abaft the beam as well as forward, the quarter is protected.

Fig. 5

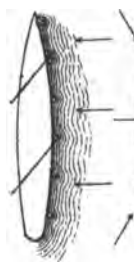
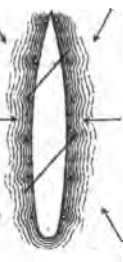


Fig. 6



Lying-to, figure 5, a vessel can be brought closer to the wind by using one or two oil-bags forward, to windward. With a high beam sea, use oil-bags along the weather side at intervals of 40 or 50 feet.

In a heavy cross-sea, figure 6, as in the center of a hurricane, or after the center has passed, oil-bags should be hung out at regular intervals along both sides.

Fig. 7

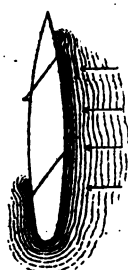
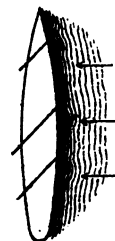


Fig. 8



Drifting in the trough of a heavy sea, figures 7, and 8, use oil from waste-pipes forward and bags on weather side, as in figure 8.

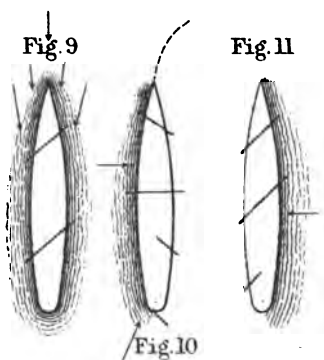
These answer the purpose very much better than one bag at weather bow and one at lee quarter, although this has been tried with some success, see figure 7.



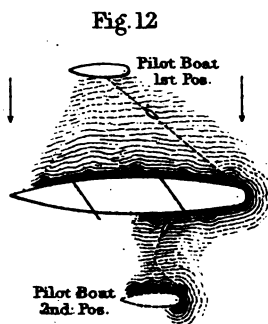
Steaming into a heavy head-sea, figure 9, use oil through forward closet-pipes. Oil-bags would be tossed back on deck.

Lying-to; to tack or wear, figure 10, use oil from weather bow.

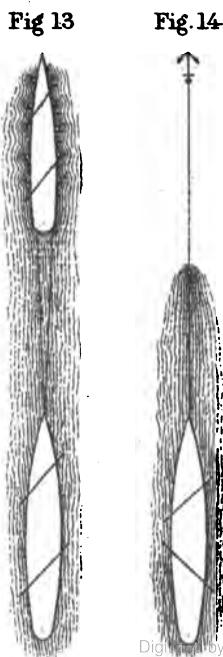
Cracking on, with high wind abeam and heavy sea, figure 11, use oil from waste-pipes, weather bow.



A vessel hove-to for a pilot, figure 12, should distribute oil from the weather side and lee quarter. The pilot-boat runs up to windward and lowers a boat, which pulls down to leeward and around the vessel's stern. The pilot-boat runs down to leeward, gets out oil-bags to windward and on her lee quarter, and the boat, pulls back around her stern, protected by the oil. The vessels drift to leeward and leave an oil-slick to windward, between the two.



Towing another vessel in a heavy sea, oil is of the greatest service, and may prevent the hawser from breaking. Distribute oil from the towing vessel, forward and on both sides, figure 13. If only used aft, the tow alone gets the benefit.



At anchor in an open roadstead, use oil in bags from jib-boom, or haul them out ahead of the vessel by means of an endless rope rove through a tail-block secured to the anchor-chain, figure 14.



## CHAPTER VII.

### ANCHORING AND RIDING OUT GALES IN DEEP WATER.

---

A general rule for anchoring is to give a scope of chain three times the depth of the water, but a safer rule is to give five or even six times the depth.

In anchoring, it is desirable to lay the chain out straight, clear of the anchor. This can be accomplished by keeping headway, or by giving the vessel sternboard before letting go.

If anchoring in deep water it is best to lower the anchor into the water until its weight is taken by the chain, and then let go from the stopper inboard. In cases of anchoring in very deep water it is well to ease the anchor down to within ten or twenty fathoms of the bottom before letting go; by doing this, command can be retained over the chain, and there is less danger of losing it.

A long scope of chain acts as a buffer against the strain of sudden jerks on the anchor and chain, caused by the ship veering about, and rising or falling to the waves. The longer the scope the greater the resistance to this disturbing power.

To increase the value of the long scope a heavy kedge, or other weight, may be secured to the bight of the cable; then veer out more chain; this will bring the strain more in a horizontal direction at the anchor and prevent the latter from tripping.

North Sea fishermen, in their small vessels, use a large cask on their cables during gales of wind, secured between the vessel and the anchor, in order to reduce the direct strain on the ground tackle.

It is recommended to use an empty cask for this purpose, in case of need, and if arrangements are made for running out oil bags to the same before it is launched, the force of the sea will be much reduced, as shown in the article on the subject of oil.

This barrel buoy serves two purposes; the vessel in veering about rides more directly from the barrel buoy than from the anchor itself; hence there is less disturbing force brought upon the anchor, and less probability of fouling it.

By taking up the strain of the chain as the vessel rides up, it guards against the quick-snapping action on the chain when the vessel tautens it

out again, the buoy being dragged through the water counteracting in part this strain.

During the war of the rebellion it was a common practice for vessels on blockading duty to ride out heavy gales of wind at sea, and on a lee shore, while at anchor, with a long scope of chain, and without using oil. Admiral Porter's reports of the operations against Fort Fisher, on the coast of North Carolina, mention numerous instances of severe gales being encountered while at anchor at that point without any accident.

### EXTRACTS

from the log books of several vessels during the gale of December 20 and 21, 1864, off Beaufort, North Carolina.

U. S. S. *Brooklyn*: On December 15, anchored with starboard anchor in 15 fathoms of water, veered to 45 fathoms of chain. On December 20 and 21 the wind freshened gradually to a fresh gale from the SW. and a heavy sea made. Early on the morning of the 21st, veered to 75 fathoms and at noon to 100 fathoms. Started engines ahead slow to ease chain. Heavy sea. Ship rolling heavily. Force of wind 7-9. On the 23d, the gale abating, hove in to 50 fathoms.

U. S. S. *Colorado*: Anchored on December 15, in 16 fathoms of water, veered to 60 fathoms of chain on starboard anchor. December 21, fresh gale, veered to 135 fathoms and started engines ahead slow. December 23, hove up starboard anchor and found the arms broken; let go port anchor.

U. S. S. *Tuscarora*: Anchored December 19, in 10 fathoms, veered to 55 fathoms on starboard chain. December 21, ship dragging, veered to 90 fathoms and steamed ahead slow. December 22, got underway, anchoring later in 11 fathoms with 90 fathoms of chain.

U. S. S. *Juniata*: Anchored in 13 fathoms of water with 45 fathoms of chain on starboard anchor, on December 19. On the 20th, a fresh gale blowing, with heavy sea running, veered to 60 fathoms. On the 21st, started to veer more chain. In veering parted stoppers, compressor bolt broke, and not being able to stop the chain, it tore the bolt out of the keelson and parted the end lashing, thereby losing 150 fathoms of chain and an anchor weighing 2,450 pounds. Got under way and stood out. Saw that nearly all the vessels in the fleet had dragged or were dragging their anchors. Twenty-second, anchored at 10 A. M. in 14 fathoms of water with 75 fathoms of chain on port anchor.

These vessels were out of sight of land and on a lee shore.

## CHAPTER VIII.

### CURRENTS.

---

Extract from the "Currents of the Great Lakes, as deduced from the movements of Bottle Papers during the seasons of 1892 and 1893," by Mark W. Harrington, Chief of the Weather Bureau.

The currents in the Great Lakes are grouped under three heads:

1. The main currents:

A general set of the water toward the outlet exists in each of the Great Lakes, forming a continuous current in that direction.

The outlet of Lake Superior being on the southern side, this current hugs the southern shore. In Lake Michigan it hugs the eastern shore, the readiest access to the outlet being on that side, owing to the position of the islands at its northern end. The same rule holds good in Lake Huron as regards the western shore. In Lakes Erie and Ontario this phenomenon is not so plainly marked.

2. Surface currents:

These are due to the prevailing winds which have always been recognized as influencing the motion of currents in large bodies of water.

3. Return currents:

The outlets of the lakes being small and insufficient for the escape of all the water banked up by the wind, return currents are inevitable.

The theory has often been propounded that many ocean currents arise from the above cause; the water driven before the wind making the current, and the piled-up water seeking an escape, forming the return current.

### OTHER FEATURES.

Barometric changes, as well as other meteorological phenomena, may have an influence on the currents of the Great Lakes. A high pressure of the barometer lying over the southern end of Lake Michigan, for instance, will lower the water at that point, causing a difference of surface level between the two ends of the lake and a resulting flow of water to the southward. Such conditions, however, could hardly endure for any great length of time.

There also occurs occasionally on the Great Lakes a phenomenon which is called a "Seiche."

"These seiches\* are uninodal, stationary vibrations of lake water. They appear in the form of waves, which alternately raise and depress the water of the lake on each side of the nodal line of the oscillation. \* \* \*

"As the area of the Great Lakes is so large, the uninodal seiche would naturally be of infrequent occurrence, as a powerful blow must be struck on a comparatively large area to produce it.

"But this uninodal vibration does exist on the Great Lakes. Gen. C. B. Comstock states in the United States Chief of Engineer's Report for 1872, p. 1040, that there is a wave constantly passing between Milwaukee and Grand Haven on Lake Michigan. The tide gauges show that there are eleven great waves per day at each of these places, and the waves have a period of a trifle over two hours.

\* \* \* \* \*

"A tracing of the tide gauge at Grand Haven, Mich., for the month of April, 1893, shows a two hour and twelve-minute period with great exactness. Every day in the month this period can be distinguished, although on some days it is almost obliterated by minute seiches, or "embroidery," while a crest is often marked by another superposed seiche in stormy weather; but the succeeding crest appears after the two-hour period. \* \* \*

"In his report for 1872, General Comstock cites some remarkable seiches observed by Major Wilson at Oswego. The first one occurred on June 13, 1872. Its period was from twenty to thirty minutes, and during its continuance a white squall passed to the north, over the lake, accompanied by a small waterspout. An employee of the survey, who happened to be out on the lake, reported that he heard strange noises, bubbles came to the top of the water, and the fish rose to the surface as if stunned. \* \* \*

"On Friday morning, April 7, 1893, the port of Chicago was visited by a tide wave, bore, a phenomenon called seiches, or in plain terms, a sudden vertical motion of the water in the southern portion of Lake Michigan, for it appears the wave swept over the beach at St. Joseph, Mich., 700 feet back from the high-water mark, the vertical rise at that point being given as 4 feet, a report which is duly authenticated from Chicago. At the latter port a recurring wave, which also characterized the St. Joseph phenomenon, caused great damage to the shipping and called forth the assistance of tugs and port officials to secure the disabled vessels broken adrift through the force of the tidal wave. \* \* \*

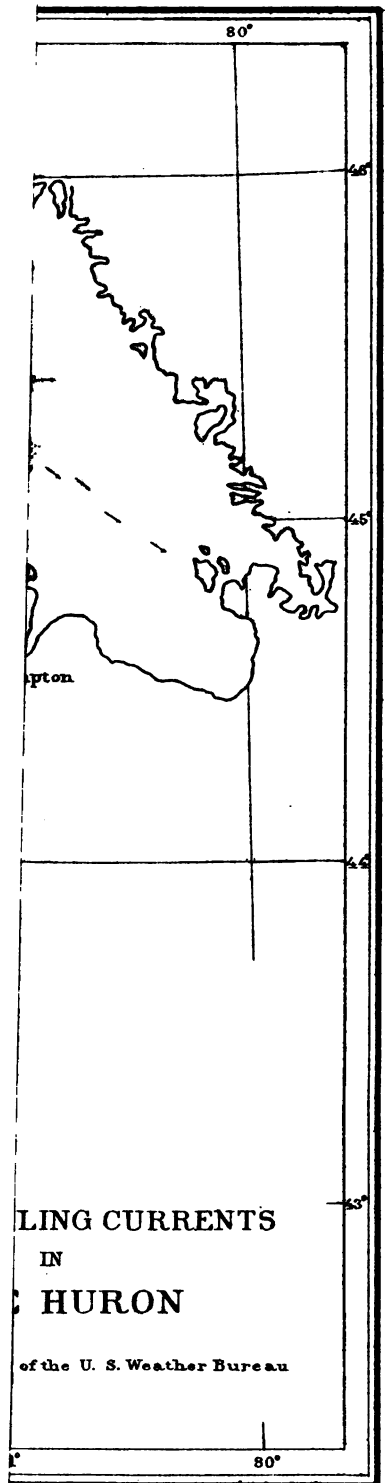
"The following extract from a letter of H. C. Frankenfield, local forecast official at Chicago, will perhaps give a good idea of the weather conditions there on April 7, the date of the above-mentioned seiche:

"High winds commenced about 2.30 p. m., April 6, blowing steadily from the SE. until 1.30 a. m., April 7, when they shifted to NNE.,

\* Extracts from an article on "The Seiche in America," by E. A. Perkins. Published in the American Meteorological Journal, October, 1893.







blowing from that quarter until 4 a. m., when they again went to SE. The velocity varied from 30 miles per hour at 2.30 p. m., April 6, to 43 miles per hour at 1.50 a. m., April 7.

“The wave occurred between 1.30 and 1.45 a. m., April 7, and its height was from 4 to 6 feet. The damage done was principally to vessels anchored in the river. Several were torn from their moorings and carried toward the lake, causing numerous collisions with other vessels. Some were carried out into the lake. I do not think the wave was preceded by smaller ones, but judging from the barometric oscillations after the principal wave, there must have been several smaller ones during the next two hours. These waves occur from time to time, and I have observed that they always occur at the time of a sudden and decided rise or fall in the barometer.’ \* \* \*

“I have received accounts of several minor seiches on the Great Lakes, but nothing that will bear comparison with the great seiche of April 7, 1892. This seems to be one of the largest oscillations ever observed on the lakes. It is to be regretted that synchronous observations of this phenomenon were not taken by tide gauges at different points on the shore.

“As to the forecasting of seiches, this can not be done with accuracy until we obtain further knowledge of the bore, and ascertain by numerous barographs the advance of sudden changes in the pressure of the atmosphere.”

From the preceding remarks it will be seen that the steadiness and persistence of the lake currents have not yet been determined accurately. Their velocities have been found to vary in speed from 4 to 12 miles a day.

The prevalence of westerly and southwesterly winds favor the strength and persistence of these currents, and it must be remembered that when the motion of the surface water has been communicated to the strata below, a brief change of wind, while affecting the surface, is not so soon communicated to the underlying water.

#### CURRENTS IN LAKE HURON.

The currents in Lake Huron differ from those in Lake Michigan, in having the main current along the west coast instead of the east coast. This current along the west coast is strong some distance out, and extends the length of the lake, turning near the south end and passing up the east coast. There is also a return current passing not far south of Manitoulin Island and at some distance from the coast. At the NW. end of the lake there are also signs of a return current.

A current passes into Great Saginaw Bay and a current which sometimes attains a strength of  $\frac{1}{2}$  knot an hour passes into Georgian Bay by the main entrance.

## CHAPTER IX.

### LIFE-SAVING SERVICE.

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[Extract from a lecture read before the Committee of Life-Saving Systems and Devices. International Marine Conference, November 22, 1889, by Sumner I. Kimball, General Superintendent of the United States Life-Saving Service.]

The cluster of inland seas known as the Great Lakes contains an area of about 80,000 square miles, and has a coast line within the limits of the United States of nearly 2,500 miles. These seas are open to navigation about eight months in the year, at other times being closed by ice, although one or two steamers cut their way across Lake Michigan at intervals throughout the winter. There are few natural harbors, but a large number of artificial ones. These are formed at the mouths of the rivers by extending piers from their banks out into the lake for a considerable distance and dredging the bottom between. The lakes are generally tranquil, but at certain seasons are visited by violent gales, which throw their fresh waters into furious convulsion with a suddenness unknown upon the ocean. Vessels unable to hold their own against the severity of these storms, being landlocked and with scant sea room, are likely to be left with only the choice between stranding wherever they may be driven and seeking refuge in the harbor that seems most accessible. The latter course is naturally the one taken. To effect an entrance within the narrow space between the piers at such times with sailing vessels, and even with steamers, is frequently a task of extreme difficulty, and the luckless craft are liable to strand upon the bar on one or the other side of the piers and meet their destruction. At some of these harbors many disasters occur in a single day.

The numerous severe gales attending the opening and closing of navigation in the early spring and late fall cause great numbers of wrecks from the enormous shipping of the lakes. As the strandings usually occur near the harbors, however, the number of stations required is not so large as it would be if they were distributed more generally on the lakes. The number at present is forty-five.

In the majority of stations the first floor is divided into four rooms; a boat room, a mess room (also serving for a sitting room for the men), a keeper's room, and a storeroom. Wide, double-leafed doors and a sloping platform extending from the sills to the ground permit the running out of the heavier equipments from the building. The second story contains two rooms; one is the sleeping room of the men, the other has

spare cots for rescued people and is also used for storage. The more commodious stations have two additional rooms—a spare room and a kitchen. In localities where good water can not be otherwise obtained cisterns are provided for water caught from the roof. There surmounts every station a lookout or observatory, in which a day watch is kept. The roofs upon the stations on those portions of the coast exposed to view from the sea are usually painted dark red, which makes them distinguishable a long distance off shore. They are also marked by a flagstaff 60 feet high, used in signaling passing vessels by the international code.

The stations (other than the house of refuge) are generally equipped with two surfboats (supplied with oars, lifeboat compass, and other outfits), a boatcarriage, two sets of breeches-buoy apparatus (including a Lyle gun and accessories), a cart for the transportation of the apparatus, a dozen signal rockets, a set of the signal flags of the international code, a medicine chest with contents, a barometer, a thermometer, patrol lanterns, patrol checks or patrol clocks, the requisite furniture for rude housekeeping by the crew and for the succor of rescued people, fuel and oil, tools for the repair of the boats and apparatus, and for minor repairs to the buildings, and the necessary books and stationery. At some of the stations the Hunt gun and projectiles are supplied, and at a few the Cunningham rocket apparatus. To facilitate the transportation of boats and apparatus to scenes of shipwreck, a pair of horses is also provided at stations where they can not be hired, and to those stations where the supplies, mails, etc., have to be brought by water a supply boat is furnished.

The few lake stations located upon the sand beaches are similar in all respects to those upon the seacoast, but those situated at the harbors differ from them in that room is provided for a heavy lifeboat and for a small boat, for quick work in the immediate vicinity of the station. The buildings are usually located not far from the water's edge, behind one of the piers of crib work forming the sides of the harbor entrance. An inclined platform, upon which are laid two tramways for the launching of the boats, extends from the boat room down to the water through an opening cut in the pier. Cradles or cars are provided on which the boats are kept mounted, and by which they can be put afloat with the men at their oars in half a minute. Exit from the surf boat wagon and apparatus cart is also provided in the rear of the building, in case it should be necessary to transport them along the shore. These stations usually have telephone connection with the systems of the adjacent towns.

The law provides that the stations on the Atlantic and Gulf coasts shall be opened and manned for active service from the first day of September in each year until the first day of the succeeding May, and those on the lake coasts from the opening to the close of navigation, usually from about the 15th of April to about the 15th of December.

For the purpose of watch and patrol the district officers establish patrol limits as far as practicable along the coast in both directions from the stations, marking them by distinct monuments, and a description of the beats thus laid out is sent to the office of the general superintendent. The day watch is kept from sunrise to sunset by a surfman daily assigned to this duty, who is usually stationed in the lookout, and who, if the patrol limits can not be seen from there, goes at least three times a day far enough along the shore to bring them into view. During thick and stormy weather a complete patrol like that at night is maintained. At the harbor stations on the lakes, at the river station at Louisville, and at other places where accidents are frequent, there is connected with the lookout a gong, by means of which the crew is alarmed when occasion requires. The day watch keeps a record of all passing vessels.

For the night patrol the night is divided into four watches—one from sunset to 8 o'clock, one from 8 to 12, one from 12 to 4, and one from 4 to sunrise. Two surfmen are designated for each watch. When the hour for their patrol arrives they set out in opposite directions along the coast, keeping as near as practicable to the shore, as far as the ends of their respective beats. If within communicating distance from an adjacent station, each patrolman proceeds until he meets another from the next station, and gives him a metallic check marked with his station and crew number, receiving in exchange a similar one. The checks thus collected are examined by the keeper, recorded in the journal, and returned to their proper stations the next night. If a patrolman fails to meet his fellow from the adjacent station, after waiting a reasonable length of time at the usual place of meeting, he continues his journey until he either meets him or reaches that station and ascertains the cause of the failure, which, on his return, he reports to his keeper, who makes a record of it in his journal.

At isolated stations each patrolman is required to carry a clock, within which is fixed a dial that can be marked only by means of a key which also registers the time of marking. This key is secured to a post at the end of his beat, and he is required to reach it and bring back the dial properly marked.

Each patrolman is equipped with a beach lantern and several red Coston hand lights. Upon the discovery of a wreck, a vessel in distress, or one running dangerously near the shore, he ignites by percussion his hand light, which emits a brilliant red flame. This serves the double purpose of warning the people on the vessel of their danger and of assuring them of succor if they are already in distress.

#### INSTRUCTIONS TO MARINERS IN CASE OF SHIPWRECK.

The accompanying information is compiled from a pocket manual, entitled "Instructions to Mariners in case of Shipwreck," issued by the United

**States Life-Saving Service.** A knowledge of the facts here stated may be of vital importance in case of shipwreck, and should be familiar to every navigator along our coasts.

#### GENERAL INFORMATION.

Life-saving stations, lifeboat stations, and houses of refuge are located upon the Atlantic and Pacific seaboard of the United States, the Gulf of Mexico, and the Lake coasts.

All stations upon the Pacific Coast are open and manned the year around, with the exception of the station at Cape Arago, which depends upon volunteer effort from the neighboring people in case of shipwreck.

All life-saving and lifeboat stations are fully supplied with boats, wreck guns, beach apparatus, restoratives, etc.

Houses of refuge are supplied with boats, provisions, and restoratives, but not manned by crews; a keeper, however, resides in each throughout the year, who, after every storm, is required to make extended excursions along the coast, with a view of ascertaining if any shipwreck has occurred and finding and succoring any persons that may have been cast ashore.

*Masters are particularly cautioned, if they should be driven ashore anywhere in the neighborhood of the stations, especially on any of the sandy coasts where there is not much danger of vessels breaking up immediately, to remain on board until assistance arrives, and under no circumstances should they attempt to land through the surf in their own boats until the last hope of assistance from the shore has vanished.*

#### SPECIAL SIGNALS BETWEEN SHIP AND SHORE.

The following signals, approved by the International Marine Conference convened at Washington in October, 1889, have been adopted by the Life-Saving Service, and will be used and recognized by the officers and employees as occasion may require:

“Upon the discovery of a wreck by night, the life-saving force will burn a red pyrotechnic light or a red rocket to signify—‘You are seen; assistance will be given as soon as possible.’

“A red flag waved on shore by day, or a red light, red rocket, or red Roman candle displayed by night, will signify—‘Haul away.’

“A white flag waved on shore by day, or a white light slowly swung back and forth, or a white rocket, or white Roman candle fired by night, will signify—‘Slack away.’

“Two flags, a white and a red, waved at the same time on shore by day, or two lights, a white and a red, slowly swung at the same time, or a blue pyrotechnic light burned by night, will signify—‘Do not attempt to land in your own boats. It is impossible.’

"A man on shore beckoning by day, or two torches burning near together by night, will signify—'This is the best place to land.'

"Any of these signals may be answered from the vessels as follows: In the daytime, by waving a flag, a handkerchief, a hat, or even the hand; at night, by firing a rocket, a blue light, or a gun, or by showing a light over the ship's gunwale for a short time, and then concealing it."

#### INSTRUCTIONS.

##### *Rescue with the Lifeboat or Surf boat.*

The patrolman, after discovering your vessel ashore and burning a Coston signal, hastens to his station for assistance. If the use of a boat is practicable, either the large lifeboat is launched from its ways in the station and proceeds to the wreck by water, or the lighter surf boat is hauled overland to a point opposite the wreck and launched, as circumstances may require.

##### *Rescue with the Breeches Buoy or Life Car.*

Should it be inexpedient to use either the lifeboat or surf boat, recourse will be had to the wreck gun and beach apparatus for the rescue by the breeches buoy or the life car.

A shot with a small line attached will be fired across your vessel. Get hold of the line as soon as possible and haul on board until you get a tail block with a whip or endless line rove through it. This tail block should be hauled on board as quickly as possible to prevent the whip drifting off with the set or fouling with wreckage, etc. Therefore, if you have been driven into the rigging, where but one or two men can work to advantage, cut the shot line and run it through some available block, such as the throat or peak-halyards block, or any block which will afford a clear lead, or even between the ratlines, that as many as possible may assist in hauling.

Attached to the tail block will be a tally board with the following directions in English on one side and French on the other:

"Make the tail of the block fast to the lower mast, well up. If the masts are gone, then to the best place you can find. Cast off shot line, see that the rope in the block runs free, and show signal to the shore."

#### RECAPITULATION.

Remain by the wreck until assistance arrives from the shore, unless your vessel shows signs of immediately breaking up.

If not discovered immediately by the patrol, burn rockets, flare up, or other lights, or, if the weather is foggy, fire guns.

Take particular care that there are no turns of the whip-line round the hawser before making the hawser fast.

Send the women, children, helpless persons, and passengers ashore first.

Make yourself thoroughly familiar with these instructions, and remember that on your coolness and strict attention to them will greatly depend the chances of success in bringing you and your people safely to land.



The foregoing instructions being complied with, the result will be shown in Figure 1.

As soon as your signal is seen a three-inch hawser will be bent on to the whip and hauled off to your ship by the life-saving crew.

If circumstances will admit, you can assist the life-saving crew by manning that part of the whip to which the hawser is bent and hauling with them.

When the end of the hawser is got on board a tally-board will be found attached, bearing the following directions in English on one side and French on the other.

"Make this hawser fast about two feet above the tall-block, see all clear and that the rope in the block runs free, and show signal to the shore."

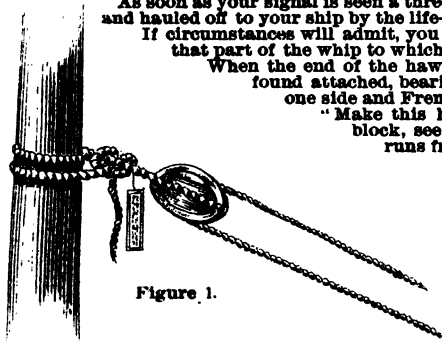


Figure 1.

These instructions being obeyed, the result will be shown in Figure 2. *Take particular care that there are no turns of the whip-line around the hawser. To prevent this take the end of the hawser UP BETWEEN the parts of the whip before making it fast.* When the hawser is made fast, the whip cast off from the hawser, and your signal seen by the life-saving crew, they will haul the hawser taut and by means of the whip will haul off to your ship a breeches-buoy suspended from a traveler-block, or a life-car from rings, running on the hawser.

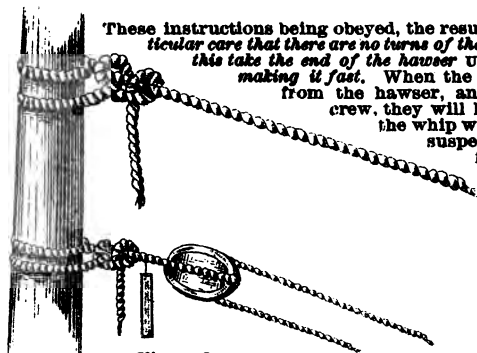


Figure 2.

Figure 3 represents the apparatus rigged, with the breeches-buoy hauled off to the ship. If the breeches-buoy be sent, let one man immediately get into it, thrusting his legs through the breeches. If the life-car, remove the hatch, place as many persons into it as it will hold (four to six), and secure the hatch on the outside by the hatch-bar and hook, signal as before, and the buoy or car will be hauled ashore.

This will be repeated until all are landed. On the last trip of the life-car the hatch must be secured by the inside hatch-bar. In many instances two men can be landed in the breeches-buoy at the same time by each putting a leg through a leg of the breeches and holding on to the lifts of the buoy.

Children, when brought ashore by the buoy, should be in the arms of older persons or securely lashed to the buoy.

Women and children should be landed first.

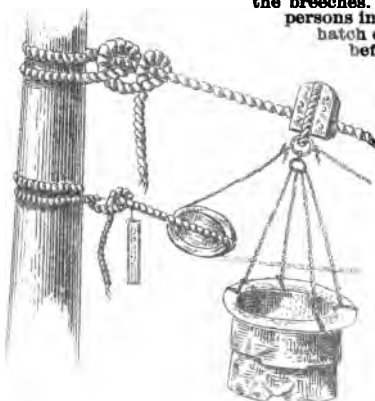


Figure 3.



## CHAPTER X.

### GENERAL INFORMATION.

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The publications of the United States Hydrographic Office for the use of mariners, comprise charts, sailing directions, and light lists, also special books and pamphlets, issued from time to time. They are subject to frequent correction, for information relative to changes in natural and artificial features received subsequent to the date of publication.

The scheme of chart publication embraces three general classes of charts:

1. **General or Sailing Charts**, which cover a large area, and are, therefore, on a comparatively small scale. These are used for laying down routes and proceeding along them. They are for general cruising purposes.

2. **Coast Charts**, which cover less area than the general or sailing charts, and are commonly on a larger scale. They are used for coasting, and for making and leaving the land.

3. **Harbor Charts** are special charts of localities, and are intended for piloting, and for various other local purposes.

For example: A vessel at sea and out of sight of land would use a general or sailing chart. On sighting land, the coast chart would be resorted to, and for entering harbor, the harbor chart would be used.

Sailing directions give additional information, to supplement that contained on the charts, and in greater detail. Light lists also supplement the charts by giving fuller information relative to lights and fog signals. There are also buoy lists published, which give, according to the latest information, the position and character of buoys, beacons, and day marks. These lists serve as checks upon the correctness of the charts.

The effort of the Hydrographic Office is to issue charts which shall be correct up to the date of issue, so far as information at hand permits. In the use of all Hydrographic Office publications, the date of issue should be considered.

**Light Lists**, published by the Hydrographic Office, which have been corrected for the latest information, are also issued. In cases where light lists published by other departments or nations are issued, the Hydrographic Office is not responsible for their correctness.

**Sailing Directions** can not, from their nature, be kept fully corrected by the Hydrographic Office by the insertion of slips, etc. Their date of

issue should always be carefully considered, and where they differ from charts of later issue, the chart should be taken as the guide.

**Notice to Mariners.**—In order that charts, sailing directions, etc., may be corrected for information received at the Hydrographic Office subsequent to the date of issue, weekly publications, styled "Notices to Mariners," are issued by the Hydrographic Office to the public free of charge. The Notices to Mariners contain brief itemized statements of special information received. The items are in such shape that they may be cut from the Notices to Mariners and pasted in books, on charts, and in the Light Lists. The Notices to Mariners also mention the publications that are affected by the several items of information. A list of charts issued and cancelled by the Hydrographic Office, and of the books published, is given in the first notice of each month.

It is seen that this scheme of supply and information assumes that navigators will keep themselves supplied with Notices to Mariners, Supplements, Light Lists, etc., in order that they may keep publications already in their possession corrected for the latest information. Notices to Mariners are supplied from the main Hydrographic Office, in the Navy Department, at Washington, D. C., or from any of the Branch Hydrographic Offices, of which there are twelve. The Branch Hydrographic Offices upon the Great Lakes are in the Masonic Temple at Chicago, and in the Arcade Building at Cleveland.

For the correction of Sailing Directions, supplements to the several volumes are published from time to time.

#### THE USE OF CHARTS.

It is obvious that the value of a chart can never be greater than the value of the survey from which it is made. A correct chart can not be made from an incorrect survey. Given an accurate survey, the appearance or character of a chart may be varied to suit the taste or need of those interested in its use. For mariners, all needless detail is commonly discarded in order that the information contained upon the chart may be impressed quickly upon the mind. Although the charts of the Great Lakes, as a rule, proceed from painstaking surveys, this is not true of all charts, especially certain charts of foreign coasts. To the experienced eye, the appearance of a chart affords a good basis of judgment as to its trustworthiness. In scanning a chart to judge of its value, certain points should be noticed, viz: the date of the survey and by whom the survey was made; the date of issue of the chart; the date at which it has received general correction, and the date at which it has received special corrections. As a rule it may be said that recent surveys are more accurate than those made many years ago. In many places the character of the bottom undergoes change, making resurveys necessary. For such places an old chart

should be accepted with caution. Where charted soundings are distributed evenly over a certain area, but are well opened out one from another, it does not mean necessarily that the soundings shown are all that were taken during the survey. The Hydrographic Office engraves upon its charts only characteristic soundings, and discards for the purpose of chart making soundings which are superfluous. If, on a chart intended to show details, there are no soundings placed over certain areas where they would ordinarily be expected to appear, it may mean that no survey has been made of the vacant areas. It is often the case, however, that soundings are not shown beyond a certain depth of water.

Even in the best surveys a detached pinnacle of rock or other submerged danger may not be discovered. This applies especially to rocky coasts and to the vicinity of outlying rocks. As a rule, therefore, rocky shores and patches should be given a reasonable berth. In using a chart, the notes printed upon it should be carefully read. It may be that charts published by different offices are based upon different plans. For example, one may refer to magnetic courses, and the other to true courses; one may give the bearings of an object on shore as taken from the vessel, and the other the bearing of the vessel from the object on shore. In respect to seaboard charts, one may give depths for mean low water, while the soundings on the other may refer to low water of spring tides, etc. It should also be noted whether the soundings indicate fathoms or feet. In some cases fathoms only are used; in others, only feet; while in other cases feet are designated to depths of three (3) fathoms, beyond which fathoms are shown. In the last case the water areas in depths less than three (3) fathoms or eighteen (18) feet, are dotted or "sanded."

#### DISTORTION OF CHARTS.

Charts printed from copperplates are subject to distortion. They are printed necessarily on dampened paper. By reason of the dampness the paper has expanded, especially in one direction; that is to say, in the direction in which the fiber of the paper runs. The dimensions of the printed chart coincide with those of the plate immediately after leaving the press, but, in drying, the paper contracts to its original dimensions, thus distorting the printed matter. Different degrees of dampness produce different degrees of distortion. It may be, therefore, that charts printed from the same chart plate at different times and under different conditions of dampness, will not coincide in all their parts. If one is superimposed on the other. When this distortion takes place the compass and graduated scales on the chart are distorted in the same ratio as other matter, hence, for the purposes of navigation, no harm is likely to result from the use of plate-printed charts.

As a rule, a chart of the largest scale available should be used for coasting and piloting. For pursuing an extended route with plenty of sea room, there is an advantage in using a chart covering greater area on which both the port of destination and of departure are shown. It should be remembered, however, that in laying down a position from compass bearings, a small error of observation, when plotted, is likely to result in less displacement of position on a chart of a large scale than on one of a small scale. In one case it may reach only yards, and in the other a considerable fraction of a mile. In laying off compass bearings on the chart for fixing a position, bearings on near objects should be used in preference to those on remote objects, because an error in observing the bearing of an object by compass, would have greater effect if continued on the chart through a long distance than through a short distance. Light Lists should always be referred to, as well as the chart, in order to obtain full details of lights. Buoy Lists of the latest issue should also be used to note, when visiting a strange port, if the buoys have been plotted upon the chart according to the latest position assigned to them. In using a Light List it should be remembered, in respect to the range of visibility of a light, as given therein, that it is true only for a certain height of the eye above the water. This is commonly about fifteen (15) feet. If the eye is higher, the light should be seen farther in clear weather, and if the eye is lower, the reverse should be the case. Commonly, the meaning is, that with the eye fifteen (15) feet above water, the light will dip below the horizon when the observer is a greater distance from the light than that of the tabulated range of visibility. Sometimes, however, a light may be so high above the water that the rule as to the range of visibility would give a range beyond the carrying power of the light itself. In such cases the range of visibility is oftentimes assigned on the basis of the power of the light. A good idea of the power of the light may be formed from noting its *order* as given in the Light List.

#### FOG SIGNALS.

In respect to fog signals, it is almost impossible to lay down any rule as to the range of audibility. The intensity of the sound and its apparent direction are very much influenced by the wind, and to such an extent that the signal may be heard from a remote distance and yet be inaudible or very faint when nearer. Mariners should beware of placing implicit confidence in fog signals.

#### VESSEL'S POSITION.

Good nautical practice requires that the master of a vessel shall know continuously the position of his vessel. In well-known channels or lanes of travel, simple visual observation may give him this information close enough for practical purposes; otherwise, he must resort to the use of his nautical charts and instruments. It is especially important that a

vessel's position should be accurately plotted upon a chart when thick weather shuts out the landmarks. On extended cruises at sea astronomical observations are the main resort of navigators for finding position, but when land is in sight closer results are obtained from compass bearings of landmarks or angular intervals between them, as ascertained by observations on board the vessel. This latter practice embraces two distinct operations. First, taking the observation with the proper instruments of navigation. Second, plotting the results of the observation upon the chart to ascertain the position. The Hydrographic Office charts are plentifully supplied with compass "roses," which give both true and magnetic bearings, marked both for degrees and for compass points.

In using a chart, the theory is that the chart represents with sufficient accuracy a certain area of the surface of the globe over which the vessel is to pursue her way, and that by geometrical processes, very simple in principle, the mariner reproduces upon the chart the actual progress of his vessel along the surface of the globe. Upon the chart various landmarks are printed, all being correctly placed in their mutual relation. If at any time the master of a vessel takes a compass bearing of each of two charted landmarks, and then by means of the compass rose, plots or draws the bearings upon the chart, the intersection of the two plotted lines of bearing, if the objects have been suitably chosen, will intersect upon the chart in the position which corresponds to the actual position of the vessel in the water or upon the globe.

In taking compass bearings it should be borne in mind that certain disturbing influences enter: First, bearings taken with any compass whatever, give only what is called the magnetic bearing of the object, and not the true bearing. This disturbance is caused by the magnetism of the earth, which varies with the locality. To correct any bad results that might proceed from this cause, some charts are provided with lines or figures showing the amount of the magnetic variation in certain localities, and also with compass roses, in different portions of the chart, arranged to correspond with the actual compass in each place, if the compass were not otherwise influenced than by the magnetism of the earth. When the compass is not otherwise influenced, magnetic observations taken by means of the ship's compass, may be laid off on the chart by using the *magnetic* compass roses. Second, in using compass bearings to obtain the ship's position, note must be taken of the error which arises from the effect upon her compass of the iron on board at the time of taking the bearings. This is serious because it differs for different ships, and even for the same ship with a different cargo, or a different arrangement of cargo, when iron enters into the question. It is oftentimes very great in amount, but may be corrected by mechanical means so as to be confined within reasonable limits, so long as the amount and disposition of the iron on

board remains unchanged. If the iron, however, is changed, the local deviation, that is to say, the deviation due to the iron on board the ship, may also change, and very greatly. In order to use compass bearings effectively, for ascertaining the position of a ship, her local deviation on each course, or on each heading of the ship, should be known and applied, since it varies with the course of the ship.

Several methods of obtaining position by means of compass bearings will be given, also the method by means of "horizontal angles." The latter, although not widely practiced by mariners, is incomparably the safer method, especially in order to get a very accurate position of the vessel when the probability of thick weather warns the navigator that he may be obliged to continue his way upon the chart without landmarks in sight, and that he should have a well defined position from which to take a departure. This method eliminates the question of compass error.

Frequently landmarks which are in range, if accurately charted, afford a certain and handy means for obtaining a position. For example, a ship may proceed upon one range which leads over a route or through a channel until she arrives upon another range, when she may perhaps change her course. A chart upon which these ranges are laid down gives at a glance the intersection of the ranges, and therefore, the position of the vessel at the time when both ranges were on.

When the chart is accurate, one compass bearing, or a range, taken in connection with a sounding, may at times give a very trustworthy position, the place of the vessel being pricked off upon the chart where the lines of bearing, or the range line, cuts the depth of water found by getting casts of the lead aboard the vessel.

Another method is by noting when two objects are in range, and then taking with a sextant or alidade, marked to degrees, at least, the horizontal angle at the vessel between the objects in range and a third object conveniently situated. The range is then penciled upon the chart and the angle laid off by means of a metal protractor, or a protractor printed upon tracing paper.

Cross-compass bearings on two landmarks have already been mentioned. When the local deviation of the compass is known, this method, it must be admitted, is more frequently used than any other; but when the vessel has much rolling or pitching motion, compass bearings are difficult to take, entirely aside from the question of local deviation. In plotting lines of bearings, the mutual relations of the lines representing angles or intersections must be considered. If the lines converge sharply upon the chart, that is to say, if the angle between the lines is small, the lines will run along each other so as to make the actual point of intersection difficult to ascertain. It is necessary, therefore, to choose such objects on shore as will give a good intersection of lines upon the chart. The



perfect intersection is when the lines cross at an angle of 8 compass points or  $90^\circ$ . Two compass points, or  $22^\circ 30'$ , is considered too small, or, at least, barely acceptable.

Sometimes a compass bearing of a single object on shore may be taken and combined with the horizontal angle at the vessel between that landmark and some other landmark which is shown upon the chart.

The best method, as already stated, because it entirely avoids compass errors, is that by two horizontal angles known among mariners as the "three point problem." For the purpose of observation there is needed a sextant, which, by the way, may be used by any one reasonably expert, even when a vessel is rolling and pitching heavily, or an alidade mounted upon a compass or otherwise mounted, and graduated to degrees, at least. By means of the sextant or the alidade, the horizontal angle, at the vessel, between two objects upon the land, known to be charted, is observed, and in connection therewith there is also observed at the same time a second angle at the vessel between one of these two landmarks and a third landmark also charted. By means of a metal or horn protractor, or a protractor printed upon tracing paper, these two angles may be transferred to the chart by so placing the sides of the angles that the several sides shall fall respectively upon the proper landmarks at the same time. The common apex of the angles is then the position of the ship for the time the angles were observed. This is the common method employed in surveying to determine the positions of the soundings which are to be placed upon the charts for the use of navigators. Habitual resort to this method will very much enhance the safety of the vessel.

Certain handy problems, in which the run of the vessel enters, are also employed to obtain the position of the ship from the observation of a single landmark. These are given and illustrated as follows:

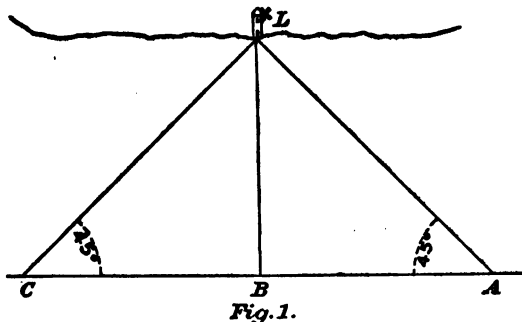


Fig. 1.

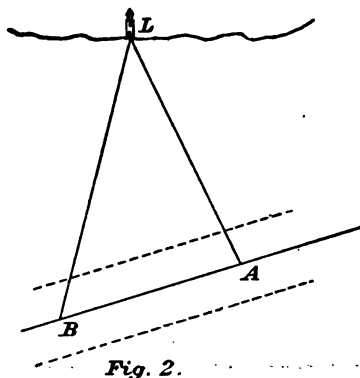
In figure 1, a vessel proceeding on her way from A to B takes a bearing of the landmark L when it bears 4 points on the bow, that is to say, 4

NOTE.—This is demonstrated as follows: The angle LBA is a right angle, and the angle BAL an angle of  $45^\circ$ , each having been so taken. The angle BLA is, therefore, an angle of  $45^\circ$ , the triangle LBA isosceles, and the side LB equal to the side BA.

points or  $45^\circ$  from the course on which the vessel is steering. Without changing her course, the vessel notes at B, when the landmark comes exactly abeam, the distance run by the vessel from A to B. If there has been no current to give a wrong impression of the distance run, or to deviate the ship from the course steered, the distance LB, of the ship from the landmark, when the ship is at B and the landmark bears abeam, is equal to the distance AB made by the ship between the two bearings A and B respectively.

A check on the correctness of the position at B may be had by noting the distance run from B when the landmark is 4 points or  $45^\circ$  on the quarter; that is to say, when the vessel is at C. In this case, again, the distance run from B to C gives the distance of the vessel from the landmark when she was at B. This is known by sailors as the "bow-and-beam-bearing" method, and is regarded as a great convenience. It is not always possible to employ this method, however.

The following more general graphical construction may be used with bearings of a single object when the lines of bearing intersect conveniently.



In figure 2, a vessel proceeds in the direction A to B without changing her course. At both A and B she takes a compass bearing of the landmark L, and at B notes the distance run on her course from A to B. A parallel ruler is set to the course AB by means of the compass rose on the chart, and the distance run from A to B is taken from the scale of the chart with a pair of dividers. The parallel rulers are then moved to and fro as shown by the dotted lines, and the dividers are applied to its edge until the parallel line AB is found, on which the intercepted distance AB is exactly spanned by the dividers as set by the scale. The line AB then represents upon the chart the course of the vessel, A, the point where she took her first bearing, and B the point where she took her second bearing.

THE COMPASS.

Points.	Number.	Degrees.	Number.	Points.
North.	0	0 0 0	0	South.
	$\frac{1}{8}$	1 24 22	$\frac{1}{8}$	
	$\frac{1}{4}$	2 48 45	$\frac{1}{4}$	
	$\frac{3}{8}$	4 18 7	$\frac{3}{8}$	
	$\frac{1}{2}$	5 37 30	$\frac{1}{2}$	
	$\frac{5}{8}$	7 1 52	$\frac{5}{8}$	
	$\frac{3}{4}$	8 26 15	$\frac{3}{4}$	
	$\frac{7}{8}$	9 50 37	$\frac{7}{8}$	
N. by E-----N. by W----	1	11 15 0	1	S. by W-----S. by E.
	$\frac{1}{8}$	12 39 22	$\frac{1}{8}$	
	$\frac{1}{4}$	14 3 45	$\frac{1}{4}$	
	$\frac{3}{8}$	15 28 7	$\frac{3}{8}$	
	$\frac{1}{2}$	16 52 30	$\frac{1}{2}$	
	$\frac{5}{8}$	18 16 52	$\frac{5}{8}$	
	$\frac{3}{4}$	19 41 15	$\frac{3}{4}$	
	$\frac{7}{8}$	21 5 37	$\frac{7}{8}$	
NNE-----NNW----	2	22 30 0	2	SSW-----SSE.
	$\frac{1}{8}$	23 54 22	$\frac{1}{8}$	
	$\frac{1}{4}$	25 18 45	$\frac{1}{4}$	
	$\frac{3}{8}$	26 43 7	$\frac{3}{8}$	
	$\frac{1}{2}$	28 7 30	$\frac{1}{2}$	
	$\frac{5}{8}$	29 31 52	$\frac{5}{8}$	
	$\frac{3}{4}$	30 56 15	$\frac{3}{4}$	
	$\frac{7}{8}$	32 20 37	$\frac{7}{8}$	
NE. by N-----NW. by N----	3	33 45 0	3	SW. by S-----SE. by S.
	$\frac{1}{8}$	35 9 22	$\frac{1}{8}$	
	$\frac{1}{4}$	36 33 45	$\frac{1}{4}$	
	$\frac{3}{8}$	37 58 7	$\frac{3}{8}$	
	$\frac{1}{2}$	39 22 30	$\frac{1}{2}$	
	$\frac{5}{8}$	40 46 52	$\frac{5}{8}$	
	$\frac{3}{4}$	42 11 15	$\frac{3}{4}$	
	$\frac{7}{8}$	43 35 37	$\frac{7}{8}$	
NE-----NW----	4	45 0 0	4	SW-----SE.
	$\frac{1}{8}$	46 24 22	$\frac{1}{8}$	
	$\frac{1}{4}$	47 48 45	$\frac{1}{4}$	
	$\frac{3}{8}$	49 18 7	$\frac{3}{8}$	
	$\frac{1}{2}$	50 37 30	$\frac{1}{2}$	
	$\frac{5}{8}$	52 1 52	$\frac{5}{8}$	
	$\frac{3}{4}$	53 26 15	$\frac{3}{4}$	
	$\frac{7}{8}$	54 50 37	$\frac{7}{8}$	

THE COMPASS—*Continued.*

Points.	Number.	Degrees.			Number.	Points.
		°	'	"		
NE. by E. .... NW. by W. ....	5	56	15	0	5	SW. by W. .... SE. by E.
	$\frac{1}{8}$	57	39	23	$\frac{1}{8}$	
	$\frac{1}{4}$	59	3	45	$\frac{1}{4}$	
	$\frac{3}{8}$	60	28	7	$\frac{3}{8}$	
	$\frac{1}{2}$	61	52	30	$\frac{1}{2}$	
	$\frac{5}{8}$	63	16	52	$\frac{5}{8}$	
	$\frac{3}{4}$	64	41	15	$\frac{3}{4}$	
	$\frac{7}{8}$	66	5	37	$\frac{7}{8}$	
ENE. .... WNW. ....	6	67	30	0	6	WSW. .... ESE.
	$\frac{1}{8}$	68	54	22	$\frac{1}{8}$	
	$\frac{1}{4}$	70	18	45	$\frac{1}{4}$	
	$\frac{3}{8}$	71	43	7	$\frac{3}{8}$	
	$\frac{1}{2}$	73	7	30	$\frac{1}{2}$	
	$\frac{5}{8}$	74	31	52	$\frac{5}{8}$	
	$\frac{3}{4}$	75	56	15	$\frac{3}{4}$	
	$\frac{7}{8}$	77	20	37	$\frac{7}{8}$	
E. by N. .... W. by N. ....	7	78	45	0	7	W. by S. .... E. by S.
	$\frac{1}{8}$	80	9	22	$\frac{1}{8}$	
	$\frac{1}{4}$	81	33	45	$\frac{1}{4}$	
	$\frac{3}{8}$	82	58	7	$\frac{3}{8}$	
	$\frac{1}{2}$	84	22	30	$\frac{1}{2}$	
	$\frac{5}{8}$	85	46	52	$\frac{5}{8}$	
	$\frac{3}{4}$	87	11	15	$\frac{3}{4}$	
	$\frac{7}{8}$	88	35	37	$\frac{7}{8}$	
East. .... West. ....	8	90	0	0	8	West. .... East.

TABLE FOR CONVERTING STATUTE MILES INTO SEA MILES.

. 1 statute mile = 5,280 feet.

. 1 sea mile or knot = 6,080 feet.

Statute miles.	Sea miles.	Statute miles.	Sea miles.	Statute miles.	Sea miles.
1.00	0.868	9.00	7.815	17.00	14.768
1.25	1.085	9.25	8.082	17.25	14.980
1.50	1.302	9.50	8.249	17.50	15.197
1.75	1.519	9.75	8.467	17.75	15.414
2.00	1.736	10.00	8.684	18.00	15.632
2.25	1.953	10.25	8.901	18.25	15.849
2.50	2.171	10.50	9.118	18.50	16.066
2.75	2.387	10.75	9.335	18.75	16.283
3.00	2.604	11.00	9.552	19.00	16.500
3.25	2.821	11.25	9.769	19.25	16.717
3.50	3.038	11.50	9.986	19.50	16.934
3.75	3.256	11.75	10.203	19.75	17.151
4.00	3.473	12.00	10.420	20.00	17.369
4.25	3.690	12.25	10.638	20.25	17.586
4.50	3.907	12.50	10.855	20.50	17.803
4.75	4.124	12.75	11.072	20.75	18.020
5.00	4.341	13.00	11.289	21.00	18.237
5.25	4.559	13.25	11.507	21.25	18.454
5.50	4.776	13.50	11.724	21.50	18.671
5.75	4.994	13.75	11.941	21.75	18.888
6.00	5.211	14.00	12.158	22.00	19.105
6.25	5.428	14.25	12.376	22.25	19.322
6.50	5.645	14.50	12.593	22.50	19.539
6.75	5.862	14.75	12.810	22.75	19.756
7.00	6.079	15.00	13.027	23.00	19.973
7.25	6.296	15.25	13.244	23.25	20.191
7.50	6.513	15.50	13.461	23.50	20.408
7.75	6.730	15.75	13.678	23.75	20.625
8.00	6.947	16.00	13.895	24.00	20.842
8.25	7.164	16.25	14.112	24.25	21.060
8.50	7.381	16.50	14.329	24.50	21.277
8.75	7.598	16.75	14.546	25.00	21.711
$\frac{1}{4}$	0.217	$\frac{1}{2}$	0.434	$\frac{3}{4}$	0.651

## SEA MILES TO STATUTE MILES.

## TABLE FOR CONVERTING SEA MILES INTO STATUTE MILES.

1 sea mile or knot = 6,080 feet.

1 statute mile = 5,280 feet.

Sea miles.	Statute miles.	Sea miles.	Statute miles.	Sea miles.	Statute miles.
1.00	1.151	8.75	10.075	16.50	18.999
1.25	1.439	9.00	10.868	16.75	19.287
1.50	1.729	9.25	10.651	17.00	19.575
1.75	2.015	9.50	10.939	17.25	19.863
2.00	2.303	9.75	11.227	17.50	20.151
2.25	2.590	10.00	11.515	17.75	20.439
2.50	2.878	10.25	11.803	18.00	20.727
2.75	3.166	10.50	12.090	18.25	21.015
3.00	3.454	10.75	12.378	18.50	21.303
3.25	3.742	11.00	12.666	18.75	21.590
3.50	4.030	11.25	12.954	19.00	21.878
3.75	4.318	11.50	13.242	19.25	22.166
4.00	4.606	11.75	13.530	19.50	22.454
4.25	4.893	12.00	13.818	19.75	22.742
4.50	5.181	12.25	14.106	20.00	23.030
4.75	5.469	12.50	14.393	20.25	23.318
5.00	5.757	12.75	14.681	20.50	23.606
5.25	6.045	13.00	14.969	20.75	23.893
5.50	6.333	13.25	15.257	21.00	24.181
5.75	6.621	13.50	15.545	21.25	24.468
6.00	6.909	13.75	15.833	21.50	24.757
6.25	7.196	14.00	16.121	21.75	25.045
6.50	7.484	14.25	16.409	22.00	25.333
6.75	7.772	14.50	16.696	22.25	25.621
7.00	8.060	14.75	16.984	22.50	25.909
7.25	8.348	15.00	17.272	22.75	26.196
7.50	8.636	15.25	17.560	23.00	26.484
7.75	8.924	15.50	17.848	23.50	27.000
8.00	9.212	15.75	18.136	24.00	27.636
8.25	9.500	16.00	18.424	24.50	28.212
8.50	9.787	16.25	18.712	25.00	28.787

## DRAFT IN SALT AND FRESH WATER.

With regard to the amount a vessel will rise in passing from fresh to salt water, the following table shows approximately :

Moulded depth in feet.	Approximate amount of rise of a vessel passing from fresh to sea water.		
	Vessels without erections on deck.	Awning deck vessels.	Spar deck vessels.
	<i>Inches.</i>	<i>Inches.</i>	<i>Inches.</i>
9 and under 11-----	2	-----	-----
11 and under 13-----	2½	-----	-----
13 and under 16-----	3	3½	4
16 and under 19-----	3½	4	4½
19 and under 22-----	4	4½	5
22 and under 25-----	4½	5	5½
25 and under 28-----	5	5½	6
28 and under 31-----	5½	6	6½
31 and under 34-----	6	6½	7

The weight of a cubic foot of salt water being taken to be 64 pounds; that of fresh water 62.5 pounds.

This table applies, as a general rule, for all except those of extremely full or extremely fine form.





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Michael Rupp & Co., No. 39 South street, New York City.  
D. Eggert's Sons, No. 74 Wall street, New York City.  
John Bliss & Co., No. 128 Front street, New York City.

Thomas Manning, No. 53 Beaver street, New York City.  
E. Steiger & Co., No. 25 Park Place, New York City.  
Thomas S. Faulkner, emigrant clearing house, Ellis Island, N. Y.  
Frank M. Porch, customhouse, Bridgeton, N. J.  
Riggs & Bro., No. 221 Walnut street, Philadelphia, Pa.  
F. J. Sloane & Co., corner Pratt street and Speer's wharf, Baltimore, Md.  
M. B. O'Neal, No. 502 East Pratt street, Baltimore, Md.  
C. C. Lapsley, No. 53 South Gay street, Baltimore, Md.  
J. J. Chapman, No. 915 Pennsylvania avenue, Washington, D. C.  
W. H. Lowdermilk & Co., No. 1424 F street, NW., Washington, D. C.  
J. H. Hickcox, No. 906 M street, NW., Washington, D. C.  
Wm. Ballentine & Sons, Washington, D. C.  
R. Bell's Sons, South Fairfax street, Alexandria, Va.  
C. F. Greenwood & Bro., No. 158 Main street, Norfolk, Va.  
Vickery & Co., No. 124 Main street, Norfolk, Va.  
Godfrey Hart, No. 24 South Front street, Wilmington, N. C.  
W. N. Harriss, with Geo. Harriss & Co., North Water street, Wilmington, N. C.  
W. A. Wilson, No. 115 East Bay street, Charleston, S. C.  
James Allen & Co., Charleston, S. C.  
J. P. Johnson, customhouse, Savannah, Ga.  
W. S. Cherry & Co., No. 89 Bay street, Savannah, Ga.  
J. W. Howell, customhouse, Fernandina, Fla.  
Horace Drew, Jacksonville, Fla.  
Robert Ransom, Titusville, Fla.  
Brelsford Bros., Palm Beach, Fla.  
H. B. Boyer, Key West, Fla.  
Alfred Brost, office of lighthouse inspector, Key West, Fla.  
Babbitt & Co., Franklin street, Tampa, Fla.  
C. D. Webster, 88 and 85 Tarpon avenue, Tarpon Springs, Fla.  
J. E. Grady, Apalachicola, Fla.  
Henry Horsler & Co., 706 and 708 South Palafox street, Pensacola, Fla.  
McKezie, Oerting & Co., 599 South Palafox street, Pensacola, Fla.  
J. R. Edwards, Mobile, Ala.  
Pollard & Bond, Mobile, Ala.  
Bright, Costello & Co., Mobile, Ala.  
Jas. S. Friar, Pascagoula, Miss.  
L. Frigerio, No. 161 Canal street, New Orleans, La.  
Woodward, Wight & Co., Nos. 38, 40, 42 Canal street, New Orleans, La.  
Frigerio & Schully, 85 Royal street, New Orleans, La.  
Chas. F. Trube, Galveston, Tex.  
E. M. Burbeck, corner Fifth and D streets, San Diego, Cal.  
W. L. Banning, San Pedro, Cal.  
Stoll & Thayer Co., 139 South Spring street, Los Angeles, Cal.  
H. A. C. McPhail, Santa Barbara, Cal.  
S. S. Arnheim, No. 8 Stuart street, San Francisco, Cal.  
Dillon & Co., No. 310 California street, San Francisco, Cal.  
Louis Weule, No. 418 Battery street, San Francisco, Cal.  
H. Lawrenson, No. 8 Stuart street, San Francisco, Cal.  
James E. Matthews, Eureka, Humboldt County, Cal.  
Griffen & Reed, Astoria, Oreg.  
J. K. Gill & Co., Nos. 28 and 30 First street, Portland, Oreg.  
James Jones, Port Townsend, Wash.  
Waterman & Katz, Port Townsend, Wash.  
Vaughen & Morrill, Tacoma, Wash.

Boeringer & Co., Tacoma, Wash.  
Frank P. Dow, New Whatcom, Wash.

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Garrett Byrne, St. Johns, Newfoundland.  
Alex. Bain, Port Hawkesbury, Nova Scotia.  
Robert H. Cogswell, Halifax, Nova Scotia.  
J. & A. McMillan, St. John, New Brunswick.  
Hearn & Harrison, 1640 Notre Dame street, Montreal, Canada.  
Hunter & Grant, Hamilton, Ontario.  
T. Darling & Co., Nassau, Bahama.  
E. J. D. Astwood, Turks Island.  
Edwin W. Wilson, 41 and 43 Obispo street, Havana, Cuba.  
J. P. Thorsen, St. Thomas, West Indies.  
James Gall, Kingston, Jamaica.  
John A. Donnatien, Port Spain, Trinidad, West Indies.  
Para, Brazil, at the consulate.  
Manuel Bottini, Montevideo, Uruguay.  
Arthur B. Dallas, Pernambuco, Brazil.  
St. Helena Island, at the consulate.  
John Newton, 2 Calle de la Constitucion, Callao, Peru.  
F. A. Markert, Guaymas, Mexico.  
Philip, Son & Nephew, 41 to 51 South Castle street, Liverpool, England.  
Alexander Dobbie & Son, 18 Clyde Place, Glasgow, Scotland.  
V. & M. Lepetit, 15 Rue de Paris, Havre, France.  
G. W. Lohmann, Schliefmuhle 21, Bremen, Germany.  
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